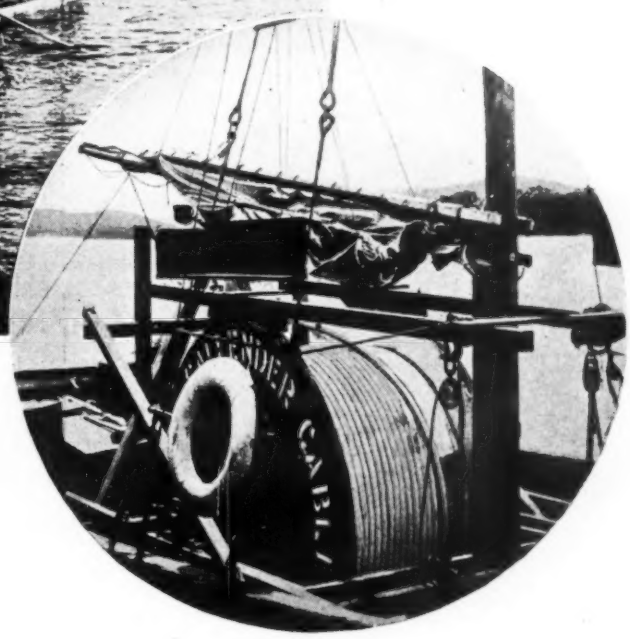
A LARGE CHANGE-OVER

The ELECTRICAL REVIEW

FOUNDED 1872

VOL. CXVII No. 3022 [All Rights Reserved] OCTOBER 25, 1935 [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage] PRICE SIXPENCE

In Southern Seas



In remote parts of the world, where modern machinery and skilled labour are unknown, electrical transmission problems sometimes have to be solved by unorthodox methods.

The Engineers concerned with the submarine job illustrated here, took every precaution by using

Callender Cables

Callender's Cable & Construction Co. Ltd., Hamilton House, Victoria Embankment, London, E.C.4

LIBRARY
UNIVERSITY OF WASHINGTON

The COOPER-STEWART ENGINEERING Co., Ltd., Stewart House, Long Acre, W.C.2

invite enquiries for

Stewart "HEATUBE"

DOMESTIC and INDUSTRIAL HEATING is easier with the new Stewart tube for BOILING PLATES, RADIATORS, FIRES, OVENS, STOVES, etc.; also for BATH HEATERS, WASH BOILERS, OIL HEATERS, and all other liquid and air heating requirements.

Stewart (patented) **"HEATUBE"** in copper or steel can be supplied in all shapes and loadings for all heating purposes.

RW-BB

RICHARDSONS WESTGARTH & Co. Ltd

COMPLETE POWER STATION EQUIPMENT

TURBO-ALTERNATORS, CONDENSERS, BOILERS & AUXILIARIES

HARTLEPOOL ENGINE WORKS HARTLEPOOL

56 VICTORIA ST. LONDON, S.W.1

BRAY CHROMALOX ELECTRIC HEATING ELEMENTS

GEO. BRAY & CO., LTD., LEEDS 2.

Mica and Micanite

INSULATORS FOR ELECTRICAL WORK
MICA BRIDGES FOR RADIO VALVES
CONDENSER PLATES, MAGNETOS & WIRELESS
Precision Stamping, Gauging, Machining

TAYLOR & PETTERS LTD
INSULATION ENGINEERS
3-11 WESTMORELAND PLACE, CITY ROAD, LONDON, N.1. Phone ..... CLERKENWELL 4105
Grams ..... MICAYLOR, LONDON.

The
Electrical Review

VOL. CXVII. OCTOBER 25, 1935. No. 3022.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "Ageekay, Sedist, London." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to Electrical Review, Ltd., and crossed "Lloyds Bank."

Index to Advertisers—See page xl.

Principal Contents:

	PAGE
Supplying Small Dwellings. By J. I. Bernard	558
A Large Conversion Scheme. By D. P. Sayers	559
Wave Form Plotting. By H. M. Clarke	561
The House Women Want	563
Leakage Relays. By G. W. Stubbings	564
Making Glass-bulb Rectifiers	565
The New E.R.A. Laboratory	566
Electricity in the Dairy	566
Meetings and Discussions	567
Impressing the Consumer. By Mabel G. Reading	568
Correspondence: Corporation and Contractors at Croydon; Ships' Electrical Installations; Illumination Values	570
Heat-storage Cooking	570
New Apparatus and Devices	571
Responsibility for Mishaps. By W. Summerfield	573
The Canadian Electrical Industry	574
Business and Industrial Notes	575
Government Contracts	579
Electricity Supply	580
Contract Information	583
Notes	584
Our Personal Column	585
Financial Section	586
Patent Specifications	589
New Work for Contractors	590

Reliability in Transmission

STRAIGHTFORWARD economic comparisons may have necessitated the use of overhead lines for transmission, but they are not by any means the only deciding factors, especially when we come to the higher voltages required to deal with the transference of large blocks of power.

Although further experience with super-voltage oil-filled cables (and probably other types also) may be expected to confirm the satisfactory results so far achieved, phase-relationship questions alone would prevent their use for an extensive a.c. network.

In his address as chairman of the I.E.E. North-Eastern Centre, Mr. F. C. Winfield intimates that d.c. is unlikely to find much scope in the conditions prevailing in this country. Present limitations in the size of the grid-controlled rectifier are against it, but it may be that generating stations will be built on the coast, as he tentatively suggests, to secure abundant supplies of condensing water. In that case d.c. feeders at a much higher voltage might well be run to feed the existing 132-kV network, just as 66- or 33-kV systems have been superimposed on the older 11-kV networks of the power companies, but whether such feeders would go overhead or underground is once more a matter of relative economics.

Cables are usually regarded as providing greater security than overhead lines, but this is not necessarily true, and the relative reliability of the two methods has undergone a "see-saw" from time to time. In the simplest form we can estimate the relative chances of interruption in supply by branches or birds spanning overhead conductors and by the effect of floods on cable networks, but it was only about ten years ago that 33-kV transmission caused fewer sleepless nights when overhead than when underground.

Since then, however, ionisation difficulties have been overcome, joints are not nearly so troublesome and split lead sheaths seem likely to be of historical interest only. Advances in the design of anti-dirt and anti-fog insulators and bird-guards have not enabled overhead constructions to overtake 33-kV cables again, as we have always lightning with us, and this is responsible for all but a small proportion of line failures.

Mr. Winfield controverts the view usually held hitherto that lightning effects are worse with low-voltage than with high-voltage lines, at any rate under 250 kV. On the other hand he shows that the extending use of auto-reclose switchgear should help materially to minimise the results of a failure and even looks forward to the time when the difficulty of synchronising two sections will not present a bar to prompt restoration of supply.

A less commonly recognised difference between the relative security of overhead and underground transmission is that the time taken to clear faults on overhead networks may be four or five times as long as that required for pilot-protected underground systems. However, Mr. Winfield tells us that investigations now in hand should reduce the maximum time to less than that now required by pilot methods.

He also hazards a prophecy that within five years we shall have lightning effects under control. Should this anticipation prove to be correct its influence on the reliability of supply by overhead lines can hardly be overestimated, quite apart from the effects of other developments which may be expected.

Tell Us Something New!

As our readers must have noticed, originality is very rare in discussions, either in the Press or in public utterances, on the subject of electrical salesmanship. Very seldom is definitely new advice forthcoming, though quite a lot of valuable practical experience is being obtained in different parts of the country by electricity supply officials and showroom and road employés. We naturally welcome well-considered opinions concerning the most desirable course to pursue in given circumstances, and records of the measure of success or failure following the use of specified means of securing business act as a stimulus to those anxious to learn and willing to try out the suggestions of others. Such matters as exhibitions and how to arrange and run them, posters and how to design them, literature and how best to

circulate it, are always with us; indeed, speaking generally, we believe that there is less lack of knowledge of the best way in which to do such things than there is unwillingness or financial inability to get a move on.

Training a Staff

AT this late date there surely cannot be anybody in control of an electricity undertaking, however small, who can say that he doesn't know what he *ought* to do or to depute somebody else to do. There is abundance of ripe experience and guidance available, but, even given the material at hand and a well-organised plan, there remains the important matter, so often referred to here, of engaging or training an efficient personnel. Both men and women have their definite spheres of usefulness, and there are not enough of them to go round if we are to embark upon a national canvass by well-equipped representatives. For many years past, through several organisations and in many undertakings, efforts have been made to educate and train electricity supply sales staffs by means of lectures on various phases of electrical salesmanship. At the present time this plan is being continued in certain districts pending the introduction of a definite training course with certificates and diplomas at the end of it. Mr. G. S. Francis, of E.D.A., is delivering eight different lectures in different areas between now and the end of December; sometimes staffs of undertakings meet in either the mornings or afternoons, or both, on certain days, and at other events public audiences are brought under the lecturer's spell.

Sales at the Stores

A FURTHER kind of activity, and a quite commendable one now that considerable sales of electrical goods and appliances are taking place at the ever-increasing number of large stores, is the delivery of evening lectures to the selling staffs of these stores, who will be more profitable salesmen if they receive a certain amount of the right kind of electrical instruction—that is, something directly applicable to their daily work. At first this is being done at the Building Centre in London, and, no doubt, if it answers here, as we hope it will, something of the same kind will be arranged for stores staffs in the provinces. These things are all to the good, forming a suitable introduction to the other part of the E.D.A.'s present campaign, namely, the formation of an army of well-trained electrical canvassers. The need for such a force is again mentioned in Mr. Bernard's article on "Supplying Small Dwellings" on page 558 of this issue. This account of the excellent work of the "Electric Supply to Small Dwellings Committee" may with advantage be read in conjunction with the article contributed by Mr. H. Marryat to our "Domestic" issue a fortnight ago.

The E.A.W. House

AT Bishop Stoke, Bristol, this week, Catherine Countess of Westmorland, opened an all-electric house erected and equipped under the auspices of the Electrical Association for Women. This is most certainly what the house agent calls a desirable residence, but its price makes it something of an "ideal home" for most women. It is beautifully furnished and decorated, and equipped with all the essentials of an all-electric house and is worth the money. We think, however, that something a trifle less ambitious is needed to show the working-class woman how electricity can be applied to her needs at a price comparable with that which she is already paying for inferior services. The million new consumers at which E.D.A. is aiming will be mainly people who live in much smaller houses than this, and we suggest that the next move of the E.A.W. should be to co-operate with as many local supply authorities as possible with wiring and hiring schemes to equip average working-class homes for exhibition purposes. This should prove a less costly and more fruitful enterprise and spread interest in the Association itself.

Modern Urban Transport

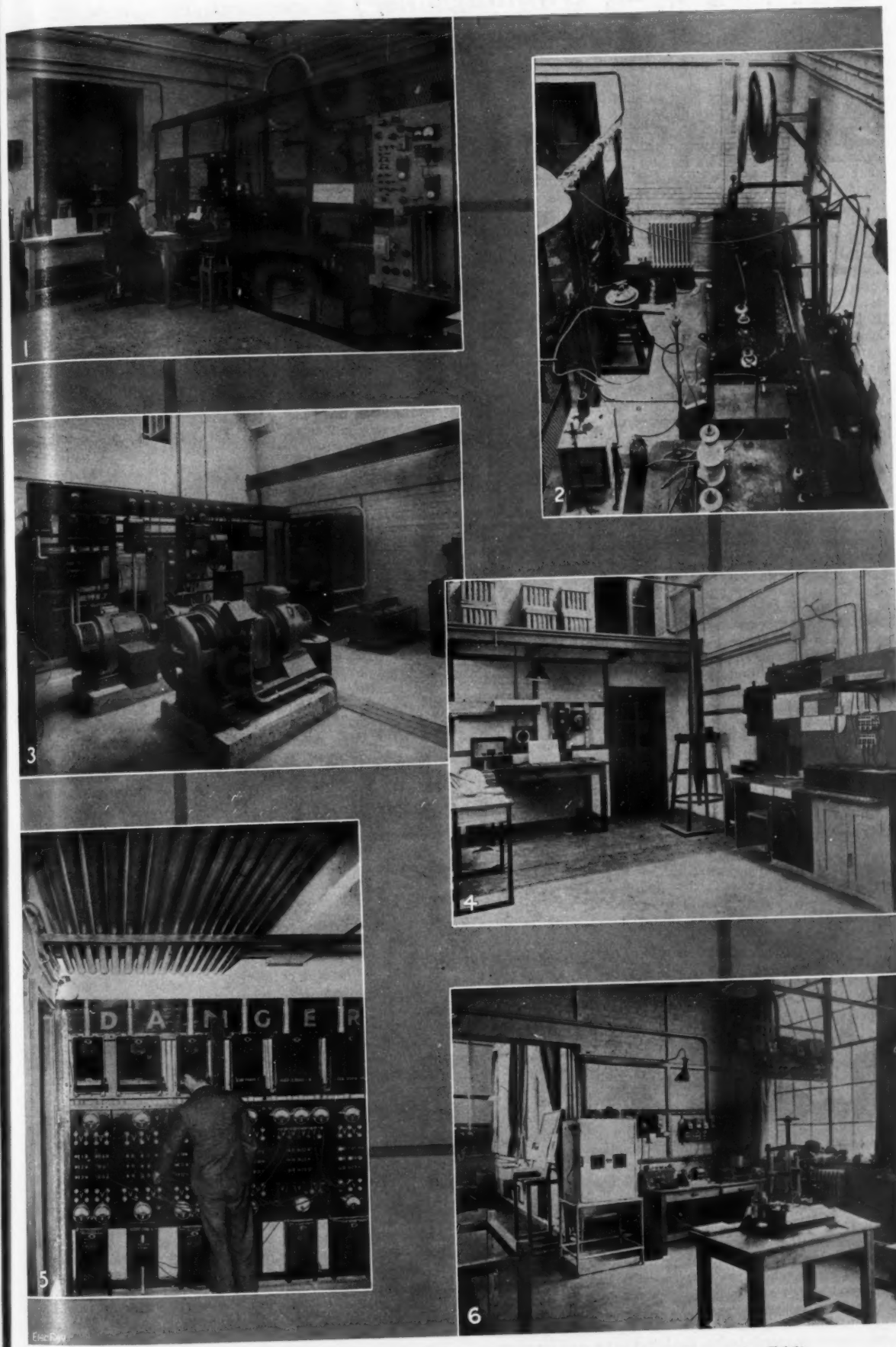
IT is fitting that Col. R. E. Crompton, so enthusiastic an advocate of mechanical transport in its pioneer days, should now show the same persistence in advancing the claims of the electric vehicle. The support he receives in the correspondence columns of *The Times* from the Coal Utilisation Council is a welcome indication that that body regards electricity as essentially a means of distributing coal to the public. Mr. W. R. Gordon, the director, does not base his appeal for the greater use of electric transport only upon the reduction in the use of imported fuel that this would entail. He argues in its favour on economic grounds, and shows, for instance, that the battery vehicle may save £15 annually over the cost of running a horse and cart, in addition to the saving of expenditure incurred in grooming and the handling of fodder. Those who witnessed the demonstration at the Bournemouth Convention in June will also credit the experience of users of battery vehicles that their easy starting and smooth acceleration make for lower maintenance charges than are obtainable with light petrol-driven lorries for urban work.

Bread upon the Waters

THERE is nothing really inconsistent between the claim of the Electrical Research Association to be "non-commercial" and the justifiable prominence given to the very large sums of money that its work has saved for our industry. While the investigations of an industrial research department do often enlarge the bounds of general scientific knowledge, their main object is to provide definite answers to definite problems requiring an almost immediate solution. The work of the Association, which often supplies the premises which are elsewhere drawn to a logical though limited conclusion, is more in the nature of an investment, and experience since its beginning fourteen years ago has shown the investment to yield a rich return. Inquiries into fundamentals can only be afforded by co-operation between all those likely to benefit (which means literally all within our industry), and the financial assistance given by the Department of Scientific and Industrial Research (representing the public which is ultimately benefited) is directly dependent upon the industry's will to self-help as expressed in the form of subscriptions to the Association.

Scope for the Accumulator

THE storage battery may have had its day as a direct adjunct to the generating sets in a power-station, where it was once so useful in improving plant load-factor, providing a stand-by, and often in obviating the running of a night shift. Yet what has been lost in this field should be more than made up in other ways. Mr. E. C. McKinnon, in his chairman's address to the North-Western Centre of the I.E.E., foresees a bright future for the battery, and names a number of applications for which it has proved its suitability. Apart from transport, sub-station auxiliary work, and communications (where silence is essential), the widest use will probably be for providing emergency supplies. While the reliability of generating plant and mains has greatly improved, and we believe will continue to improve, so has the need for reliability become greater. The number and diversity of duties entrusted to electricity have so increased that any failure means much more than a short period of inconvenience in such places as hospitals, theatres, cinemas and large stores.



The New Laboratories of the Electrical Research Association (See page 566)

1. A corner of the high-voltage laboratory. 2. 80-kV and 50-kV transformers for dielectric tests. 3. The generating room. 4. Cable-testing equipment. 5. Low-voltage distribution plug board. 6. Insulation abrasion test room for asbestos-covered conductors (*Photograph No. 3 by Wakefields, Ealing, remainder by* ELECTRICAL REVIEW)

Supplying Small Dwellings. By J. I. Bernard, B.Sc., A.M.I.E.E.

A valuable E.D.A. publication

THE new E.D.A. Report No. 1288, "Electric Service in the Small Household," is undoubtedly an important milestone along the road to electricity for the million.

The origin of the report alone must command respect as it has been prepared by the Electric Supply to Small Dwellings Committee of the Association, which includes many supply engineers who have taken a leading part in domestic development in densely populated industrial areas. Members of the Committee are: Capt. J. C. Chaytor, chairman (Tamworth District E.S. Co.); Capt. J. M. Donaldson, vice-chairman (North Metropolitan E.P.S. Co.); Messrs. W. N. C. Clinch (Brighton), W. R. Elliott (East Ham), B. Handley (Portsmouth), A. J. Hutchinson (Farnworth), F. N. Rendell-Baker (Croydon), L. Romero (Salford), V. A. Pask (Norwich), F. W. Purse (London and Home Counties J.E.A.), S. Tillotson (West Hartlepool), J. W. J. Townley (West Ham), and J. N. Waite (Hull). The writer of this article acted as secretary to the Committee.

Anyone who is familiar with the towns mentioned will agree that the combined experience of the members of the Committee deserves very careful attention. In this connection it should be noted that the report is unanimously supported by every member. The general scope of the report is well illustrated by the following quotation from the introduction:—

> "The supply of electricity to small households occupied by the weekly wage-earning sections of the community was originally beset with many difficulties, but the pioneer work carried out by many supply authorities during recent years has proved that by means of a progressive policy based on sound economics the benefits of electricity for all domestic purposes can be brought within the reach of the smallest home on terms which are favourable to the consumer and profitable to the supplier."

The report begins by stating the type of house dealt with, *i.e.*, a house or flat having a rateable value of £15 p.a. or less, inhabited by weekly wage-earners and consisting of no more than five rooms. The total number of occupied houses of five rooms or less in Great Britain was given in the last census as 7,240,643. Some of these are already scheduled for demolition, but if only 5,000,000 houses of this type are considered as prospective users there is a market waiting for the profitable sale of 6,000,000,000 kWh per annum.

Before presenting the advisability of complete electric service in houses of this type, the report investigates the amount of money which this class of consumer can afford to pay for electricity. It is shown that, according to the Ministry of Labour, the total expenditure on fuel and light is roughly 5s. out of an income of 50s. per week. Actual family budgets which have been recorded by social workers generally confirm this figure, and it is therefore assumed that the total amount available for expenditure on fuel and light of any kind is between 4s. and 5s. per week.

It is the general practice for houses of this type to be fitted with one coal fire, and the amount of coal burned in this for general warming and incidental cooking is about 1 cwt. per week. No claim is made for the abolition of the coal fire for such heating purposes in winter time; in fact, the report expressly points out that the coal fire brings about the diversity of load which is needed by supply authorities to enable them to supply energy at the low prices which are necessary in order that electric service shall not cost the user more than old-fashioned methods. Allowing, therefore, for the coal fire, the amount of money available if the remainder of the heating and lighting is to be provided electrically varies from 2s. 6d. to 3s. 6d. per week.

The Provision of Appliances

These are fairly substantial amounts for which a considerable amount of electricity could be supplied at present-day prices if the supply of energy were all that was involved, but, as the report goes on to state, suitable schemes for the electrification of this class of property must include the provision of wiring and appliances. In other words, nobody requires electricity as such, but a lighting, heating and cooking service which implies that the supply authority must provide the means of using electricity—lighting points, cooker and wash-boiler—on terms which the user can afford to pay.

The report goes on to make recommendations in regard to the sizes of cables, meters and appliances which have been found suitable. It is shown that the provision of a modern electric cooker and wash-boiler, the latter to be used for supplying hot water for domestic purposes and for the bath, meets all the washing, water-heating and cooking requirements of the small house, and that the consumption of electricity by these two appliances, in addition to lighting, will amount to between 20 and 40 kWh per week, depending upon the size of the family and the amount of use which is made of the coal fire.

The final section of the report, dealing with tariffs and methods of charge, is admittedly the most difficult aspect of the subject. With regard to the form of tariff, the Committee recommends most strongly the two-part principle. The difficulty of adapting such a tariff, together with the collection of hire charges for wiring and appliances, to the needs of the user who usually finds it impossible to lay his hands on more than a shilling or two at a time is discussed in detail.

It is suggested that probably the most satisfactory method is to arrange for the landlord to collect the fixed charges with the rent, the consumer buying electricity through a simple slot meter set at the unit rate. In other cases a two-part tariff meter may be used, but where neither of these methods will satisfy local conditions the offer of an equated rate has proved successful, providing that it is based on the two-part tariff principle; that is to say, a minimum number of kWh per month per quarter must be stipulated in order to cover fixed charges in giving the supply and the hire charges of the appliances.

What is the Cost?

Assuming these methods of charging are adopted, how does the user's bill work out? The report gives the following typical figures:—

	s.	d.	
Hire purchase of lighting wiring, 6 points at 1d.		6	per week.
Hire of cooker, 5s. per quarter, hire of washboiler, 2s. 6d. per quarter ... ... say	7		"
Standing charge on a small house of say 5 rooms, 36s. p.a. say	8		"
	1	9	"

This leaves, out of the 2s. 6d. to 3s. 6d. per week which was given originally as the sum that the consumer could afford to pay, from 9d. to 1s. 9d. per week for the purchase of electricity; these amounts will buy, at ½d. per kWh, 18-42 kWh per week, which corresponds very closely with the amount of energy previously stated as being required to perform the necessary cooking and heating.

The report has so far dealt with the problem in the most approved manner, that is to say, by analysing the market, and it remains to show whether supply authorities can provide the service on these terms.

As regards the hire charges, the figures given are quite typical of those already in force; but can electricity be profitably supplied at 8d. per week plus ½d. per kWh? Evidently the Committee thinks that it can, because it points out that an analysis of the costs of a number of undertakings shows that if the rate per kWh is ½d. the remaining charges, including maximum demand charge for bulk supply, amount, on the average, to £9 per kW of system demand. As the demand of groups of small houses in terms of system peak has been proved to be only 200 W per house, it will be seen that this is exactly covered by the standing charge of 36s. per annum or 8d. per week which is assumed in the typical bill.

The Contractors' and Manufacturers' Share

Having settled the schemes which are satisfactory for the supply authorities, the question may be asked, how do these plans affect the rest of the electrical industry? In the first place, it is obvious that schemes for the complete electrification of millions of small houses must mean a large volume of work for the contracting side of the industry, but, from the very nature of the problem, profits must come from a large turnover; this class of property generally consists of street after street of houses almost identical in design and construction, and the wiring of them may be described as the nearest thing to mass production that will ever happen in installation work.

For manufacturers of cable, fittings and appliances, the prospect of this great increase in domestic electrification which will account in the aggregate for orders in excess of one hundred million pounds, should be noted not only by sales managers but also by designers and others who can help in the simplification and standardisation which is necessary to achieve the lowest possible installation cost.

The report concludes with a short section dealing with business-getting methods, and here there is room for thought by those responsible for the organisation of those teams of canvassers which are so urgently needed if all this business is to be obtained before another generation arises that will not need to be "sold" the advantages of electricity. We must make no mistake about it, this business cannot be obtained only by advertising and showroom sales—we must have more outside representatives. Men and women must be properly trained and adequately paid to go round and tell people in their own homes what electricity can do for them, and how simply and cheaply electric service will make their home life easier and happier.

A Large Conversion Scheme. By D. P. Sayers, B.Sc., A.M.I.E.E.

The change-over from d.c. to a.c. in Northern Ireland

MANY interesting problems arose during the d.c. to a.c. change-over carried out over a period of seven months by the Electricity Board for Northern Ireland. In addition some eighty miles of low-voltage distributors have been reconstructed during the past twelve months.

The work concerned twelve provincial undertakings acquired by the Board from companies. In each case d.c. was generated in small local power stations ranging in size from 30 kW to 600 kW and distributed mainly by overhead lines.

The circumstances were peculiar in many respects. The towns were scattered, the distance from the head office at Belfast ranging from about twenty to fifty miles, whilst the most distant towns were seventy miles apart.

As the records of d.c. mains and consumers were meagre, the work had to be started largely in ignorance of the existing conditions and requirements. Change-over took place concurrently with acquisition and thus coincided in most cases with complete change of tariffs, conditions of service and personnel, in addition to the complete reconstruction of the mains. With two exceptions the towns had been operated previously by non-statutory authorities, and there were thus no statutory conditions governing the change-over.

At the outset the following main lines of policy were laid down :—

(*a*) To do the change-over work by direct labour, as the conditions did not lend themselves to quick and economical execution by contract, but to reconstruct the mains by contract, and to secure co-ordination and undivided responsibility by carrying out the whole of the operations under the supervision of the consulting engineers.

(*b*) To complete in the shortest time in order to minimise inconvenience to consumers and the loss of revenue to the Board due to the inability of the old plant and mains to deal with any real development.

(*c*) To change over consumers' apparatus where possible in non-statutory as well as statutory undertakings in order to retain the goodwill of all consumers.

(*d*) To lay out the new a.c. mains on such a scale as to cater for all likely developments for many years, and to provide mains in every street.

The costs of local d.c. generation were much in excess of the costs of a.c. delivered from the existing high-voltage lines; hence priority was given to the changing over and the supersession of local generating plant.

The preparation of specifications for mains reconstruction at short notice was a formidable task owing to the variety of conditions and types of d.c. systems and the meagre information available both of the existing equipment and of the ultimate requirements. However, specifications were issued during January, 1934, and a contract covering the whole of the work was placed during March, 1934. Notwithstanding the difficult nature of the work, more than 90 per cent. has been carried out at the schedule rates included in the original tender.

The recruiting of a large staff of engineers with the requisite experience presented difficulties, and its most effective disposition was not at once obvious owing to lack of knowledge of the problems ahead. It was a case at first of feeling the way, and the head office organisation was gradually established. There were appointed an engineer whose duty was to organise and co-ordinate the various sections; a consumers' engineer, responsible for ordering all change-over apparatus and dealing with wiring work and questions concerning consumers; a wireless specialist; a chief surveyor, with two assistant draughtsmen; an installation foreman, and two clerical assistants.

ELECTRICITY BOARD FOR NORTHERN IRELAND.

Consumers to be Changed Over.

No.....

ADDRESS (Rd. or St.)..... Town .....

No..... Date of Visit.....

NAME of CONSUMER .....

Present Method of Feed.....

Existing Equipment		Type and Size or other particulars	Condition
Service Wires.			
Lead-In.			
Meter Board			
Meters.			
Cutouts.			
Consumer's Wiring			
Apparatus	Not to be changed.		
	To be changed.		
Prospective additional Apparatus.			
REMARKS			

Signature of Engineer.....

Fig. 1.—Record of a visit to a consumer

In each town there was a resident district engineer, with one or more assistants, responsible for supervising all the work, both direct-labour and contract.

The first essential was the preparation of plans showing accurately the position of all existing poles and distributors. For this purpose velographs of the Ordnance Survey maps on a 1/2,500 scale were used and once the tracing had been marked, prints were taken off as required without further work.

To distinguish between such items as wood and steel poles, stays, struts, street lamps and underground mains, conventional markings were standardised; by this means each layout tracing could be readily marked and understood without the need for specially coloured prints which would have entailed

Fig. 2. Left: A street in one of the "changed-over" towns showing the surface wiring under the eaves of the houses. Right: A neat method of connecting surface wiring to the overhead mains

a great deal of extra work. No attempt was made on the layout plan to distinguish between different numbers and sizes of conductors, but a separate tracing was prepared to show this information in the form of a mains diagram.

A second velograph and tracing were used for the proposed new a.c. layout and mains diagram respectively. This procedure avoided any confusion between the old and the new systems and allowed easy reproduction of the plans without colouring or special marking of the prints.

One of the earliest difficulties encountered was that certain of the Ordnance Survey maps were twenty years out of date, and many new roads and properties were not shown. As accuracy was essential, both for engineering and wayleave requirements, the plans had to be brought up to date, the Ordnance Survey Department giving valuable assistance.

In marking the layout plans, reference letters were given to the principal streets or sections in each town and the poles in each section numbered consecutively; similarly, the consumers in each section were numbered consecutively. This system provided a ready means of co-relating consumers, mains and wayleaves, which proved its value in all the succeeding stages.

The next step was to explore each town, street by street, and visit every consumer connected to the mains. In most of the towns the d.c. mains meandered round the backs of houses into all kinds of unexpected places and no little care was required to ensure that no consumer was overlooked. Particulars of each installation were entered on a "Consumers Visited" form as shown in fig. 1. For obtaining the exact particulars required for ordering a.c. replacement motors special forms were devised.

In addition to collecting information of existing equipment, the visiting engineers distributed pamphlets and literature explaining the new tariffs and conditions of supply and made every effort to stimulate interest in electric cooking and the other improved services available with the Board's supply. Visits averaged about seventy-five per week per engineer, and the total work absorbed approximately sixty man-weeks.

At an early stage in the operations suitable premises were secured in each town as a local office and stores and equipped with telephones. In addition to the apparatus required for the change-over, the stores were stocked with considerable quantities of materials for internal service reconstruction work. Wiring squads of from ten to thirty men, depending on the size of the town, were then recruited, each squad normally comprising one charge hand, with installation testers, linesmen, skilled wiremen, mates and storekeeper. The wiring squad in each town worked under the supervision of the resident district engineer, but one engineer based on head office was appointed as installation foreman with a roving commission for general supervision of the wiring work in all towns. This appointment proved useful in maintaining close liaison between the different districts, in ensuring that the wiring staffs were distributed and organised in the most effective manner, and in assisting towards uniformity in the methods and quality of the work in each town.

During early visits to consumers' premises, the engineers reported adversely on the condition of the majority of the installations, which were often thoroughly dangerous. A staff of high-grade wiremen was recruited for the work of inspection and testing and equipped with neon test lamps and "Meggers."

The procedure adopted was for the inspector to make a general inspection, limited to what could be seen by a careful tour of the premises, together with a test of the insulation resistance. The results were recorded on a standard form shown in fig. 3 in a triplicate book, and where the installations complied with the statutory requirements as regards leakage insulation, the inspector handed a copy of the report direct to the consumer, together with a printed covering letter recommending the consumer in his own interests to have any points noted in the report attended to.

Where the insulation was definitely defective, the report was first checked by the district engineer and then sent to the consumer with a covering letter, which included the same recommendations but also pointed out that a further test of the insulation resistance would be made in six weeks' time, and if the results were still unsatisfactory the Board would then have no option but to disconnect the supply.

Faults recorded in the majority of installation reports were defective bonding and absence of earthing; brass-capped switches installed in stone-floored rooms or in close proximity to wash basins; and switches not in the live side of circuits.

Between 10 and 25 per cent. of the installations inspected in the different towns had defective insulation. Pressure had often to be put on consumers to rectify the faults and there were arguments as to who was liable for the cost. However, a further period of grace was allowed after the six weeks had expired wherever the consumers showed evidence of good intent, and it was finally necessary to cut off only some 3 per cent. of the installations originally reported defective.

The rate of testing, including re-tests, worked out at twenty to forty per week per man, depending on the class of installation.

ELECTRICITY BOARD FOR NORTHERN IRELAND.

INSTALLATION INSPECTION REPORT.

Serial No. **A 399**

Ref. No.....

Consumer's Name. M..... **Address**..... **District**

RECOMMENDATIONS.	OBSERVATIONS AND REMARKS.
1. Insulation Resistance. Insulation resistance to earth in megohms should not be less than 25 divided by the number of points.	Number of points : : : **Lighting.** **Heating.** Total load (watts) : : : Resistance to earth (megohms) (All lamps in and switches closed) Resistance between lines (megohms) (All lamps in and switches open)
2. Wiring. All joints in wiring should be made in properly designed joint boxes. All conduits and sheathing of lead-covered cables should be efficiently bonded and connected to earth. All ironclad switches should be earthed.	Type of wiring : General condition :
3. Switches and Lamp-holders, etc. Switches and lamp-holders should be placed out of reach of anyone occupying the bath or wash-basin, and where persons touching them may also be in contact with stone floors, water pipes or other earthed metal objects they should be of the all-insulated type. Radiators or other apparatus should not be used in bathrooms unless permanently fixed and earthed.	
4. Switches in Live Wire. All single pole switches should be connected so as to control the "live" side of the circuit.	
5. General Remarks.	

Signature of Inspector..... Date of Visit.....

Fig. 3.—An installation inspector's report

Supervision of Costs

A system of stores records was designed to supervise the costs in each town and prevent irregularities, but no attempt was made to develop a detailed costing system. All materials purchased were covered by official orders issued from head office and the goods were despatched direct to the district stores. Receipt of the goods was recorded on goods-received notes and entered on stores stock cards, duplicate copies of the former being passed to head office for the clearance of invoices. All materials used were covered by requisition notes and entered on the stock cards. The district stores were visited periodically by an inspector from head office, who checked the cards against orders, requisitions, materials, and stock in hand.

A system of time sheets and wages-summary sheets was also required for the payment of workmen's wages which amounted to about £400 per week at the peak period of the work.

Most of the d.c. overhead systems were in a deplorable

state of disrepair and prior to any change-over steps were taken to minimise the risk of accidents, as set out below :—

(*a*) The system was patrolled and weak points such as broken insulators, unsound poles, or joints in wires, made safe.

(*b*) Where the overhead wires were uninsulated and in horizontal formation (which applied almost everywhere) a simple form of earth guard made up with No. 8 s.w.g galvanised-steel wire was fitted. The horizontal formation of wires complied with the Overhead Line Regulations for 220 V d.c. but not for 230 V a.c.

(*c*) Many of the old poles were fitted with unprotected wires running from their tops down into the ground presumably as lightning conductors. As such wires might be dangerous and are prohibited under the Overhead Line Regulations they were cut down.

(*d*) Practically all the old existing stay wires were uninsulated and were fitted with insulators.

(*e*) Where consumers' installations were not fitted with double-pole main cutouts and switches these were put in wherever possible.

When settling the positions of high-voltage switchboards a schedule was prepared showing in detail the h.v. spur lines, switchgear, transformers, and l.v. equipment, temporary or otherwise, required to make connections between the new sub-stations and the existing l.v. mains. A second schedule was then prepared showing what wayleaves and site acquisitions were involved in the initial work. These schedules enabled all legal arrangements to be made without delay.

By means of the schedules above dates were estimated by which low-voltage a.c. supplies would be available at various points, and detailed programmes of change-over were drawn up for each town based on these dates. The work in each town was laid out for changing over blocks of about seventy consumers per week, the maximum rate which could be satisfactorily handled with the staff available. The actual rate of changing over for all towns averaged about 120 per week from start to finish, the record being about 300.

The principal points that had to be dovetailed into the detailed programme were: When all items of a.c. apparatus could be ready on site; when three-phase supplies, where required, could be made available either by rearrangement of the existing d.c. wires or by running additional wires; and when the consumers' installations could be prepared for a.c.

The completion of these programmes was regarded as urgent, as once they had been established, all sides of the work, *i.e.*, testing, rewiring, ordering of apparatus, reconstruction of mains, and wayleaves, could be correlated into a common sequence.

The "Consumers Visited" sheets referenced numerically in sections correlated with the mains became the keystone on which the whole of the work was based.

In a later article I hope to deal with the detail work of changing consumers' apparatus. Acknowledgment for permission to publish the foregoing information is due to the Electricity Board for Northern Ireland and to the consulting engineers, Messrs. Kennedy & Donkin.

Wave Form Plotting. By H. M. Clarke, B.Sc., A.M.I.E.E.

An improved method

WHILE the oscillograph gives much assistance to the observer in the examination of wave forms, particularly when dealing with transients, the point-to-point method, although only available when the effect is maintained for a time sufficient to make the necessary observations, is more reliable for quantitative results. A serious disadvantage of the latter method is that a synchronous contact is required and, as this is at present obtained mechanically, a certain amount of energy must be supplied by the test circuit. The range of test frequencies is also comparatively limited.

Circuit Arrangement

The following method requires much less energy from the test circuit than a mechanical synchronous contact. Two similar pentodes A and B (fig. 1) are connected in push-pull, their grid biases being made comparatively adjustable, while a microammeter is connected between their anodes. The centre-tapped secondary of an input transformer is included between the grids as shown. C is an argon-filled gas-type relay and D is a neon lamp with a large difference between striking and breaking voltage, or it may be a valve of the same type as C.

A synchronous alternating voltage of at least 220 V r.m.s., preferably more, is applied to EE'. The grid bias of C is made sufficient to prevent C from flashing when D is not in its holder. The bias of D, if a valve, is such that the flash voltage is as high as possible, but somewhat less than the crest value of the applied voltage. During the rise of voltage in the positive half period both C and D are black until a value of volts is reached at which D strikes. The striking current produces a voltage drop in r_3 and in r_2. In the former case the drop is applied to the screen grids of the pentodes;

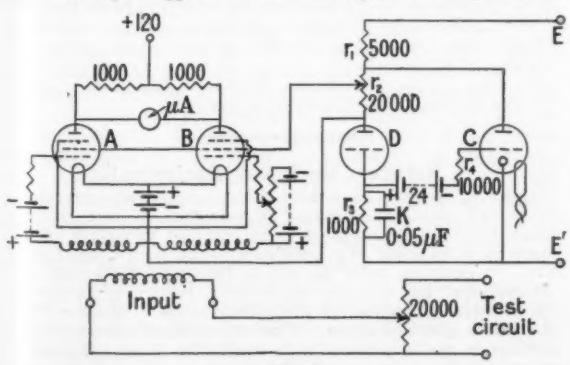


Fig. 1

in the latter the drop in r_3, delayed by the charging time of K, gradually changes the grid bias of C, and eventually causes it to flash. When C flashes, the voltage across D falls below its maintaining value and it ceases to take current. The voltage drop in r_2 vanishes and C continues to arc until the applied positive voltage has fallen below the maintaining value, when C also ceases to take current.

The time interval between the flash-over of D and that of

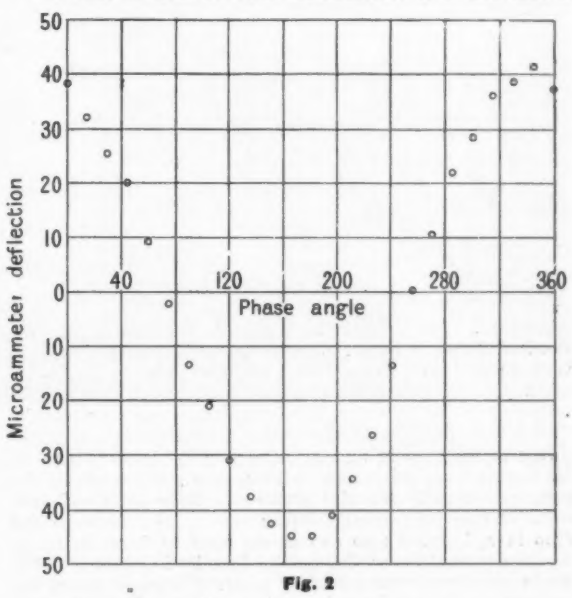


Fig. 2

C is determined by the values of r_1, r_2, r_3, K and the excess bias voltage of C. This time interval may be made a very small fraction of the synchronous periodic time. During this time the valves A and B will be sensitive to any changes of their grid voltage, so that their biases may be adjusted until the microammeter reads zero. Moreover, if a periodic potential is applied to the input terminals, the secondary e.m.f. will be injected into the grid circuits and the microammeter will give a deflection proportional to the instantaneous secondary e.m.f. at the moment of flashing of D, and if a long period instrument be used a steady deflection will be obtained.

During the negative half period, even if D should strike, the negative drop in r_2 would have no effect upon A and B. It will be seen, therefore, that C and D constitute a device for obtaining an impulse voltage across r_3 once per period of the applied voltage, and of an adjustable duration and magnitude by variation of the amount tapped off from r_3. The minimum effective time is limited by the type of valve used for D and C; for example, the mercury vapour relay is unsatisfactory as it will not respond rapidly enough even on 50 cycles, and it has the further disadvantage of irregularity of striking voltage due to casual variations of vapour pressure.

The magnitude of the voltage drop in r_3 is clearly decided by the available applied voltage and the difference between the striking and breaking volts of D. As the drop in r_3 should be of the order of 100 V, 400 applied peak volts is a good figure.

In order to complete the wave form it is necessary to alter the time phase of the applied volts and a phase-shifting device must be used. In this connection the following arrangement may be worth mentioning. Three equal resistances connected in star to the three-phase mains can be tapped to give constant volts not exceeding phase volts at regular phase intervals, provided the load current tapped off is small compared with the current taken from the mains. It should be noted, however, that the tappings have different voltages to earth.

Intervals of ten electrical degrees were used to plot the wave form of voltage from the mains, the resulting curve being shown in fig. 2. Apart from the phase-shifting device, the power required from the test circuit does not exceed 10 W. The values given to the circuit constants in fig. 1 are equivalent to a contact time of about one electrical degree. The detector may be calibrated by injecting known voltage differences into the grid circuits.

Possible Modifications

The detector arrangements might be modified considerably; for instance, screen grid valves or screen grid pentodes might be used with the advantage of working with smaller input voltages. The push-pull method is not imperative; a single valve, with or without anode steady current neutralisation, may be used. The use of an input transformer was found to be desirable in order to avoid difficulties due to common points between the grid input and the injected drop across r_2. This does not arise if EE′ can be separated from the test circuit, and then the input transformer can be replaced by a centre tapped resistance.

It is probable that greater reliability can be obtained by using only hard valves instead of gasfilled relays, and the circuit of fig. 3 is suggested to supply the impulse voltage instead of C and D in fig. 1. During the rise of synchronous volts on EE′ no current flows until the volts are about 236 when the s.g. valve begins to take current, and, during the next four or five volts rise, this current increases very rapidly. This causes the bias of the triode to become less negative owing to the drop in r_3, and eventually the triode begins to take current. This causes a drop in r_1, which should be sufficient to make the bias of the s.g. valve again so much negative that its current becomes zero. At this stage the drop in r_3 becomes zero and means must be found to maintain the current in r_1; this can be done by injecting into the triode grid circuit the secondary e.m.f. of a transformer, the primary of which is in series with r_1, or by use of a reaction condenser. The injected voltage, of course, must have the correct direction in making the grid more positive. The triode continues to take current until the applied voltage has fallen almost to zero, and in any case to a value less than 240. Neither valve takes current during the negative half-wave. The duration of the impulse voltage across r_2 will depend upon the rate of rise of current in the screen-grid valve, the rate of rise of volts across r_3, the excess bias of the triode. The values of resistance depend upon the peak applied voltage and must be adjusted to keep the anode voltages to safe values. The power taken by this arrangement from the test circuit should not exceed one watt.

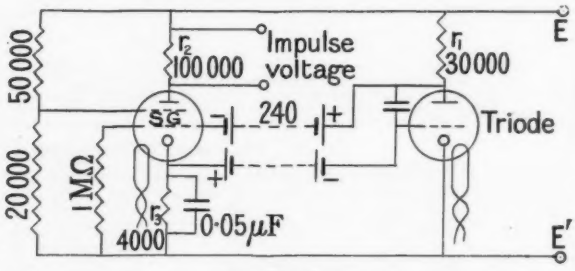


Fig. 3

Securing Greater Adaptability

A great improvement in the adaptability of the method can be effected by obtaining the synchronous voltage with phase shifting by means of a valve system which derives its power from a local battery and which is supplied only in its grid circuit from the test circuit. If this can be done the total power taken from the test circuit will be limited to power supplied to two grid circuits and can be kept very low. Fig. 4 illustrates one simple form of circuit which might achieve this purpose. It is based on the oscillator of Van der Pol and Van der Mark recently described by Colebrook.*

The oscillating triodes G, H and J form a three-phase system, three-wire or four-wire according as the common lead to the positive high-voltage terminal does or does not contain a large choke impedance. The circuit constants can be adjusted until the natural period of oscillation agrees with that of the test circuit. If now a small voltage from the test circuit be injected into the grid circuit of one of the valves, the oscillation will take up the phase of the injected voltage. If, further, a power output stage L be excited *via* a selector switch from the grids of G, H and J, the synchronous voltage required for EE′ of fig. 3 may be obtained from the output terminals, or step-up transformer if higher voltage is desired.

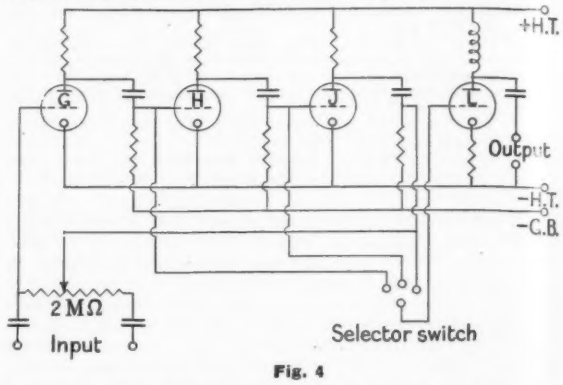


Fig. 4

A Simple Phase-shifting Device

A simple phase-shifting device (fig. 5) consists of a symmetrical resistance capacity bridge. Of course, the capacities must be made inversely proportional to frequency if the angular calibration of the resistance tappings is to be the same for all frequencies, and the condenser impedance should be $\sqrt{3}$ times the resistance to obtain 60 deg. phase shift for each position of the power grid selector switch. The other half-wave can be obtained by reversing either the input or the test circuit terminals. A choke condenser filter can be inserted between the bridge and the test circuit if it should be found necessary to smooth the input to the oscillating circuit. Some means should be adopted of observing the value of the voltage EE′ and if necessary adjusting it to a fixed value.

If the oscillator is not made to synchronise with the test voltage, but is allowed to take up its own frequency, the impulse voltage will slip relative to the test voltage and an ondographic moving system can be connected in parallel with the indicating microammeter. The indicating circuit can be designed to give sufficient power to work the ondograph pen and any constant speed motor may be used to drive the revolving cylinder. The slip frequency can be adjusted in the GHJ circuit to give a whole number of slip cycles per revolution of the drum, in which case different quantities can be traced at their correct relative phase displacements. A switch can be provided to change from ondograph to the point-to-point method of plotting, if so desired.

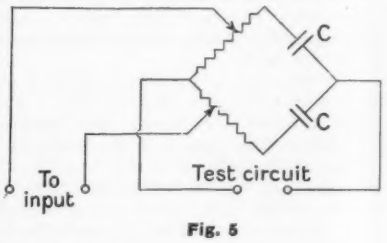


Fig. 5

* *The Wireless World*, Feb. 8th, 1935.

Rectifiers for X-Ray Equipment

The h.v. rectifiers associated with X-ray equipment appear to receive little consideration beyond that of how inexpensively they can be replaced. An attempt to remedy this is made in a forty-six page brochure issued by Philips Lamps, Ltd. It explains, with the aid of thirty-three diagrams and illustrations, the general functions of rectifying valves and the relative efficiencies of the several glass, "Metalix," and the latest gasfilled types. The main object of inserting a rectifier in the h.v. circuit is to enable the X-ray tube loading to exceed the value at which reverse emission would occur and damage the filament. Various circuit arrangements are described to show how valves may be combined to permit both half-waves of single or three-phase h.v. supplies to be employed, while by further combinations of valves and condensers the output voltage may be increased to several times that of the h.v. input transformers.

The House Women Want

IT has long been the complaint of women that they have to live in homes designed by men whose ideas are not always based on an intimate acquaintance with the housewife's needs. To remedy this state of affairs the Electrical Association for Women has had a building erected at Stoke Bishop, Bristol, to demonstrate what a woman's house should be like.

The Association wanted a house costing £1,000, this figure to include as much electrical equipment as possible. Accordingly a dwelling complying with this condition was designed by Mr. Adrian E. Powell, A.R.I.B.A., and built by Messrs. Simmonds & Son, Bristol. The wiring installation was entrusted to Messrs. W. T. Porter & Co., Bristol, and the building and equipping of the house was carried out under the personal supervision of the originator of the scheme, Mrs. A. J. Newman, chairman of the Bristol and District branch.

The house was opened on Wednesday by Catherine Countess of Westmorland, in the presence of the Lord Mayor and Lady Mayoress of Bristol, Sir John Brooke, vice-chairman of the Electricity Commission, and other distinguished visitors. It will remain open daily from 10.30 a.m. until 8 p.m. until November 22nd, and by means of the publicity resulting therefrom the Association hopes to encourage women to ask that electrical equipment should be included in the price of their houses, and to stimulate them to take more interest in the general design, construction and wiring of their homes. It also seeks to obtain reliable cost figures.

Of orthodox modern flat-roof design, the house is built on an ordinary suburban narrow plot measuring 45 ft. by 142 ft., with no ideal conditions or aspect, the land being owned by the builder.

The electric lighting system is comprehensive and many novel effects are obtained. All cupboards and wardrobes are automatically lighted, and the book-shelves in the living room writing recess are illuminated by a concealed lamp. A lighting box over the front door serves to show up the name of the house and the bell push, while it also illuminates the hall. Similar boxes are provided on each side of the dining room window and the effect is particularly striking when the curtain between the dining and living rooms is drawn aside. Remote control is provided, examples being the garage light which can be operated from the front door, and fires in the bedrooms, which may be switched on or off from the bed.

Heating is by directional and inset fires and tubular fittings, and much ingenuity has been shown in selecting the best places for installing them. Tubular heaters are used for warming the kneehole of the writing desk in the living room, the children's toy cupboard and the drying cupboard. The last-named is outside the back door, being approached under cover.

1. The dining room with built-in fire, trolley "hotlock" and other special features. 2. The living room furnished in a modern style. There is an electrically warmed toy cupboard under the side window. 3. The hall, showing the black-glass "pylon" for the telephone with a built-in electric fire. 4. The well-equipped kitchen

Clothes are hung on racks and a fan blows hot air through them. A thermostatically controlled heater is used in the linen cupboard.

Altogether three directional fires, six inset fires, twelve feet of tubular fittings, the linen cupboard heater and an electric towel rail are included in the heating equipment covered by the price of the house, in addition to which a 1½-gal. water heater and a 15-gal. bath water heater are hired.

The kitchen contains a built-in refrigerator above which is a slightly warmed cupboard for storing purposes. There is a large selection of electrical equipment, but this is not included in the cost of the house.

For the wiring of the house the "Wylex" all-in system of Messrs. G. Scholes & Co., Manchester, was used, and three separate pieces of apparatus can be connected simultaneously to some of the sockets. The electric clocks are wired back to the meter so as to prevent household equipment being plugged into the sockets and to secure continuous running.

The chief suppliers of electrical equipment were as follows:—

Messrs. Berry's Electric, Ltd., Belling & Co., Bulpitt & Sons, Ltd., Burnley Components, Ltd., J. A. Crabtree & Co., Ltd., Electrolux, Ltd., Electric and Musical Industries, Ltd., Ferranti, Ltd., Gardiner, Sons & Co., Ltd., General Electric Co., Ltd., Hotpoint Electric Appliance Co., Ltd., Heatrae, Ltd., Hoover, Ltd., Hotlock, Ltd., Moffats, Ltd., Midland Electric Manufacturing Co., Ltd., G. H. Scholes & Co., Ltd., Simplex Electric Co., Ltd., Thor Electric Appliances, Ltd., Unity Heating, Ltd., British Thomson-Houston Co., Ltd., Crysteleo, Ltd., Edison Swan Electric Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., and Siemens Electric Lamps and Supplies, Ltd.

Leakage Relays. By G. W. Stubbings, B.Sc., A.M.I.E.E.

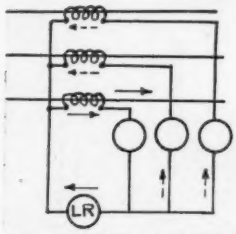
The performance of current transformers

THE so-called earth leakage protective circuit was the first to be evolved in which the relay branch nominally carries no current when the condition of the main circuit is normal. This circuit can be considered as one which gives the resultant of the three line currents of a three-wire three-phase circuit, a resultant which is necessarily zero except when the main circuit becomes virtually four-wire by the incidence of an earth fault.

According to the doctrine of symmetrical components, the relay branch of a leakage protective circuit can be considered to carry the sum of the zero sequence components in the three lines. As all these components are, by definition, in phase they add arithmetically, and accordingly the current in the relay branch of the protective circuit corresponds to three times the zero-sequence component. The resultant of the three line currents of a three-phase system is usually known as a residual.

Transformation Errors

Correspondence of the current in a leakage relay with the residual in the main circuit is only approximate, due to errors of the current transformers forming part of the protective circuit. A statement of this kind applies to the current in any secondary circuit, but on account of the interconnection of three current transformers in a leakage protective circuit the fractional difference between the actual and the nominal current in the relay is greater than that corresponding to the error of a single transformer. This point is illustrated in fig. 1. Here is the diagram of a leakage protective circuit, in which are included apparatus, ammeters or relays, carrying the



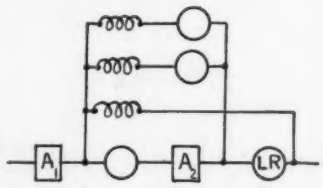


Fig. 1.— (left).—Leakage protective circuit. Fig. 2.—A simple equivalent circuit

secondary currents of the three current transformers. Let it be assumed that the only current in the main circuit is that due to an earth fault in phase C. The magnitude of the secondary current of this transformer will depend upon its inherent characteristics and upon the external burden, which consists of the relay or ammeter connected directly to the secondary terminals and also of the leakage relay. The whole of the secondary current of the C-phase current transformer does not pass into the leakage relay. Due to the voltage across the terminals of this relay small currents will pass into the secondary windings of the current transformers in A and B phases, as shown by the dotted arrows. The magnitude of these currents in the secondary windings of A and B transformers varies with the impedance of the leakage relay.

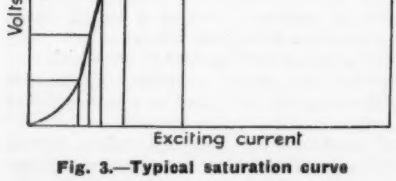


Fig. 3.—Typical saturation curve

While the impedance of the directly connected burden in circuit with the active current transformer increases the error of transformation from the main circuit to the relay branch of the protective circuit, similar impedances of directly connected burdens in circuit with the idle transformers tends to diminish this error. The effect of the burden of the current transformers not carrying fault current may be small in the conditions stipulated, in which there is no current but that due to an earth fault in the main circuit. When, however, fault current is superimposed upon heavy load or short-circuit currents, the effect of this burden may be material.

If the turns ratio of a current transformer is equal to the nominal ratio, the effect of the transformer errors can be represented in a single circuit by shunting the actual burden by the secondary of the current transformer, with the primary open-circuited. The difference between the currents passing into the parallel circuit and that in the branch comprising the burden corresponds very closely to the ratio error, while the phase difference between these currents is approximately equal to the phase error of the transformer. This equivalent circuit is a very convenient one for studying the performance of a

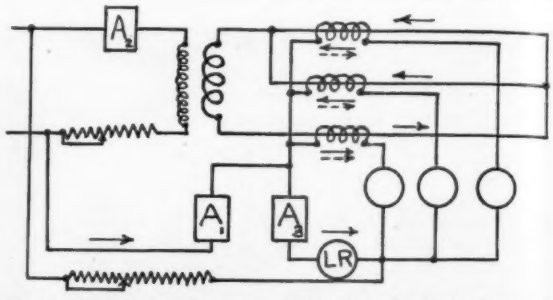


Fig. 4.—Circuit for the approximate investigation of current transformer performance

current transformer when the highest accuracy is not required, and a corresponding equivalent circuit to that shown in fig. 1, is given in fig. 2. Here one current transformer shunts the directly connected burden and the leakage relay, while the other two secondary windings, with the directly connected burdens in series, shunt the directly connected burden of the first transformer. The ammeter A_2 indicates the value of the current in the leakage relays with an earth fault current in the main circuit of fig. 1, the magnitude of which is equal to the reading of ammeter A_1 multiplied by the turns ratio of the current transformers, provided this earth fault current alone flows in the main circuit.

The equivalent test circuit considered shows that the transformation ratio of fault current to current in a leakage relay is affected by the current-transformer interconnection as if the relay were shunted by impedances equivalent to the transformer open-circuit impedances in series with the external burdens. If, on the incidence of an earth fault current, the circuit is carrying other currents (either due to loading or to a single-phase short circuit) which have no residue, the shunting effect of the transformers on the fault-current transformation will be modified. Thus if in fig. 1 current flows due to a short-circuit between B and C phases, as well as to an earth fault in C phase, the voltage tending to produce current in the relay will also tend to increase the current in the secondary winding of the B-phase transformer. The effect of the stray current in this transformer will be to demagnetise the core, and the current straying per volt applied to the leakage relay terminals will depend upon the magnetic condition of this core. Fig. 3 is a typical saturation curve for a current transformer; on the axis of ordinates representing voltage are marked equal increments, and on the horizontal axis the corresponding increments of exciting currents, showing that the effect of a stipulated voltage on the leakage relay in producing stray current will be much greater when the current-transformer cores are saturated, due to the flow of heavy short-circuit current in their primary windings, than when the magnetic condition of the core approximates to maximum permeability. The ratio of transformation from earth-leakage current to relay current, therefore, depends upon the load or short-circuit current upon which the leakage current is superimposed. The effect of secondary current straying from the leakage relay to the windings of other transformers would be difficult to work out completely, but if an earth fault current is superimposed on a symmetrical load of normal magnitude, the ratio of transformation from fault current to relay current will probably be more favourable than when the circuit is carrying no load. If, however, the conditions are such as would occur if an earth fault current and a short-circuit appeared simultaneously, then, due to possible saturation of the cores of the current transformers not carrying the residual current, the ratio of transformation with respect to the leakage relay might be very unfavourable.

An Experimental Circuit

An experimental circuit for the approximate investigation of the possible performance of current transformers operating a leakage relay is given in fig. 4. The primary windings are energised by single-phase current, and the condition of an earth fault is simulated by passing into the secondary net-

work, from an insulated source, sufficient current to operate the leakage relay. The reading of the ammeter A_1 multiplied by the turns ratio of the transformers represents the primary fault current required to produce a current in the relay corresponding to the reading of ammeter A_3. The ammeter A_2 gives a measure of the loading of the main circuit. To simulate fault conditions the direction of the superimposed current should be such that if one of the leads connected to the secondary terminals of the transformers in A or B phases be disconnected, the current in the leakage relay decreases.

The effects considered above may not be serious when current transformers having a considerable number of ampere-turns are used, but when a leakage relay is operated by bar-primary transformers of small rating, their transformation characteristics for earth leakage currents are desirably investigated experimentally.

Making Glass-bulb Rectifiers

AMONG recent developments of the Electric Construction Co., Ltd., is the manufacture of glass-bulb mercury-arc rectifiers, for which there is an ever-increasing demand, the complete unit now being made in the company's Wolverhampton works.

Wide experience in the electrical industry as far back as 1882 enabled the company to manufacture all components except the bulbs, and now these also are made at the works, an extensive glass shop, equipped with modern plant, having been built for their production. Not only is the highly skilled work of fabricating them carried out by British workmen trained by the company, but the raw material is obtained from a local glass works.

Other components of a rectifier are a main transformer, a number of auxiliary transformers, and usually a fan motor. The transformers are built in another new extension of the E.C.C. works. The cubicles and switchgear for controlling the rectifier are manufactured in the firm's switchgear department.

The smallest bulbs are for 15 A, and the largest 500 A at 500 V. Bulbs can be made for any voltage, but the current output obtainable decreases as the voltage increases. The company has in course of construction bulbs for supplying d.c. at 10,000 V.

Glass-bulb rectifiers with grid control for governing the supply, and also for voltage regulation, are regularly made by the company. As an alternative to grid control, voltage regulation on load can be obtained by induction regulators or an on-load tap-changing switch.

An indication of the reliability of these glass-bulb rectifiers is the fact that underwriters are willing to insure them for a modest premium.

Rectifier bulbs in process of manufacture at the E.C.C. works, and (right) a single-bulb type with self-contained transformer

The Season's Programme

THERE are few industries which have a fuller winter programme than the electrical industry.

The electrical gourmand can find at least one dinner a week during the season, apart from gatherings at which merely mental nourishment and stimulants are provided. The I.E.E. presidential address is not the starting signal for there have already been several electrical meetings, but it marks the commencement of the spate of electrical engagements with which the hard-pressed journalist endeavours to keep pace.

The I.E.E. itself is responsible for a great many meetings and other functions during the session. The President delivered his address yesterday (Thursday) and now the ordinary meetings will come at more or less regular intervals for about six months. The Transmission Section's Conversazione is to be held on November 1st and the sectional dinners commence with that of the Meter and Instrument Section on the 15th of that month. Close on its heels follow the dinners of the Mersey and North Wales Centre (November 25th), the Scottish Centre on the following evening, and the South Midland Centre on the 29th. In December falls the dinner of the Tees-side Sub-Centre (13th), and in January the Western (13th), North Eastern (24th), and North Western (28th) Centres hold theirs.

The Institution's annual dinner takes place on February 13th and the remaining sectional dinners are the Sheffield Sub-Centre's on February 19th, and the North Midland Centre's on March 6th.

The dates of the other principal annual dinners are as follows:—Association of Consulting Engineers, November 15th; B.E.A.M.A., November 21st; Radio Manufacturers' Association, December 4th; Association of Supervising Electrical Engineers, February 15th; Institute of Transport, February 21st; Institute of Marine Engineers, February 28th; and Institution of Civil Engineers, March 4th. The Electrical Contractors' Association will hold its annual dinner on January 28th; the Electrical Wholesalers' Federation has not yet fixed the date of its annual dinner which will be held in February.

Two other important events to be noted in the electrical man's diary are the E.I.B.A. Ball on November 26th and the Electrical Engineers' Ball on February 14th, the night after the annual dinner of the I.E.E.

Looking well ahead into the conference season we find that the I.M.E.A. will resume its annual conventions during the first week in June at Edinburgh, and later in the month the I.E.E. will hold its summer meeting and the E.C.A. conference will take place. The Royal Sanitary Institute's Health Congress, which nowadays possesses a good deal of electrical interest, is being held in July.

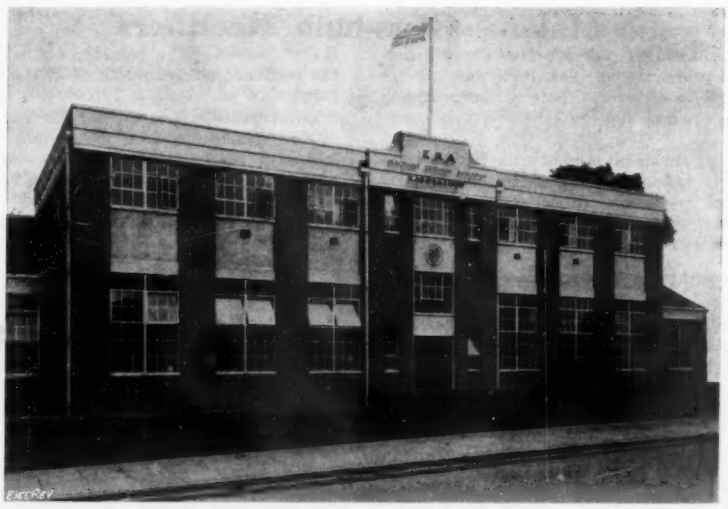
During the same month the annual conversaziones (home and overseas) of the I.E.E. will take place.

The New E.R.A. Laboratory

THE auxiliary laboratory of the British Electrical and Allied Industries Research Association was opened by the Duke of Kent on Tuesday, the chair at the opening ceremony being taken by Sir Richard Glazebrook, a former director of the National Physical Laboratory.

Most researches have hitherto been conducted in existing establishments such as the National Physical Laboratory, universities and manufacturers' laboratories, but further facilities were found to be necessary for special investigations and these will be provided in the new building.

Situated in Wadsworth Road, Perivale, the laboratory, which consists of a centre block of two storeys and two single-storey wings designed for extensions, has a total floor space of 14,000 sq. ft. There is room for a staff of eighty, but at present the number accommodated is thirty-three.



The new E.R.A. laboratory at Perivale which was opened by the Duke of Kent on Tuesday (*Photograph by Wakefields, Ealing*)

At the east side of the ground floor are the power-frequency and heavy-current sections with a trench for tests on cables laid horizontally, the standardising and physics laboratories and the generator room. On the same side is also the equipment for researches on heavy-current circuit-breakers. The west side contains radio and telephone, high-voltage (up to 80 kV) and chemical laboratories together with the workshop and main store.

A 450-Ah battery which is charged automatically during the night through a mercury-arc rectifier, furnishes supplies at 230-V maintained constant by an automatic voltage regulator. A second 500-Ah battery gives 16-V supplies.

Over each investigator's bench is a switchboard from which numerous a.c. and d.c. circuits can be obtained. Those in most general use are permanently connected to ring mains; others can be linked up *via* plug boards at central points. Distribution switchboards are situated in a gallery over the ground floor passages. The first floor contains the administrative offices, library and kitchen. A large flat roof is used for open-air tests; running through it and down to the ground floor is a shaft for vertical tests on cables.

The technical work of the Association as a whole is supervised by Mr. E. B. Wedmore, the director, who is assisted by forty-seven engineers and physicists and thirty-two clerical workers. The Association is supported by the Department of Scientific and Industrial Research and by leading bodies in the electrical industry, supply undertakings in the Dominions and Colonies, and consulting engineers and other interested individuals. It is conducted under the guidance of a Council (of which Mr. C. P. Sparks is chairman and Mr. J. Murphy secretary) and there are seventy-five technical committees composed of about 450 recognised authorities on various subjects.

Electricity in the Dairy

THERE is a very definite indication at this year's Dairy Show at the Royal Agricultural Hall, Islington, London, that electricity is beginning to be regarded as a normal rather than an exceptional aid in the dairy and on the dairy farm. For mechanically-operated apparatus such as bottle washing, filling and capping machines, separators and milking machines, the individual electric motor drive is nowadays nearly always employed and with the gradual lowering of prices there will soon be no excuse for even the smallest farmer not to use electricity.

By far the greatest number of electrically operated machines on show are bottle washers, fillers and cappers, either as separate units or combined. Several improvements have been introduced since last year. For example, in the combined machine (3,500 bottles per hour) of Messrs. Dawson Bros., Ltd., an improved type of conveyor has been incorporated, while both crates and bottles are dealt with in one operation in the new "Jubilee" tunnel washing machine, dealing with 2,000-10,000 bottles per hour, made by Messrs. A. Grabham & Co., Ltd., who also have rotary washers of both continuous and intermittent types.

A bottle filler which stamps and fits aluminium caps is a product of the U.D. Engineering Co. Other bottle-washing and filling machines of particular interest are to be seen on the stands of Auto-Dairy Engineers, Ltd., Boucher-Giles & Co., Ltd., Cherry-Burrell, Ltd., Clare's, George S. Clayton, Ltd., Cockx & Sons, R. Powley & Sons, Ltd., R. W. Webster & Co., Ltd., Alka, Ltd., and Hills of Hull.

Pasteurisers are well represented and among new separators is a ball-bearing model by Messrs. R. A. Lister & Co., Ltd., capable of dealing with 220 gal. per hour. The "Westfalia No-foam" separator (600-1,100 gal. per hour) is exhibited by the Dairy Outfit Co., and the Alfa-Laval Co. has a variety of models. Messrs. Lister & Co., also show a power-driven butter moulder, while the Kustner automatic butter-wrapping machine is displayed for the first time by Messrs. S. Thomson & Co.

An electric sterilising chest manufactured by Messrs. Aveling-Barford, Ltd., is available in four sizes, 12, 27, 48 and 75 cu. ft., with loadings of 4, 6, 9 and 15 kW respectively. Very little water is required since it is condensed and used again, and recent improvements have considerably reduced the time necessary to ensure complete sterilisation, consequently saving current.

Refrigeration machinery is exhibited by Messrs. J. & F. Hall, Ltd., the Graham-Enock Manufacturing Co., Ltd., Perkins Clean Milk Equipment, Ltd., and Frigidaire, Ltd. The last-mentioned company also demonstrates a fully automatic milk cooler of the direct expansion type dealing with 300 gal. per hour.

The new Alfa-Laval type "C" milker is operated by a ¼-h.p. motor and is particularly suitable for herds of 10-20 cows. Vaccar, Ltd., shows plant for twenty cows and upwards, other types of equipment being the auto-recorder plant made by Messrs. Gascoigne (Reading), Ltd., the "Manus" machine (R. J. Fullwood & Bland), and the McCormick-Deering Grade "A" model shown by the International Harvester Co. of Gt. Britain, Ltd.

A portable cow and horse shearer running on castors is a new product of the Wolseley Sheep Shearing Co., Ltd., a high-duty model without castors also being available. Messrs. Beatty Bros., Ltd., are exhibiting pumping sets, and Mechanical Coal Stokers, Ltd., "Redi" stoking plant.

In the poultry section up-to-date types of all-electric incubators are to be seen on the stands of Curfew Electric Heaters, Ltd., Petersime Incubators, H. P. E. Neave & Papworth Industries, the last-mentioned also showing a new egg tester incorporating twelve lamps and testing 112 eggs at a time.

To give some idea of the increasing popularity of the electric vehicle for local delivery work Messrs. A. E. Morrison & Sons, Ltd., are displaying the eighty-fifth van supplied to the Midland Counties Dairies, Ltd. Messrs. Taylor & Backhouse, Ltd., have a representative selection of both "Metrovick" and "Auto-Electric" vehicles, a feature of which is the use of a direct drive with a consequent reduction in transmission losses.

In the gallery surrounding the main hall the British Electrical Development Association has an information bureau where interesting literature and helpful advice relating to all aspects of electric dairy farming are freely available.

Meetings and Discussions

Arcing and Lightning: Auxiliary Power Station Proposal: Radio and Shipping

Circuit-breaking and Lightning

In his address as chairman of the South Midland Centre of the Institution of Electrical Engineers on October 16th, Mr. F. H. Clough dealt mainly with a.c. circuit interruption and voltage impulses.

He showed that the voltage across an arc is determined by the rate of change of current in conjunction with the reactance in the circuit, and this depends mainly on the mechanical rotation of the heavy masses of the generator and to a limited extent only on the manner of operation of the circuit-breaker. Prevention of the re-striking of the arc after extinction at the end of a half-cycle provides the key to circuit interruption.

When the contacts part the consequent arc is comparatively short and has a low resistance so that the current continues to flow as though metallic continuity still existed. The high temperature of the arc fills the intervening space with metallic vapour and ionised gases formed by the dissociation of the oil. The sudden formation of gas causes a pressure to be transmitted through the oil and resisted by the tank of the breaker.

As the power factor is usually low the voltage across the breaker tends to rise to full value as soon as the arc ceases, when the path may be still ionised. The arc may then be re-established and will continue with a more intense evolution of gases as it is no longer due to the motion of the contacts. De-ionisation has now been made so rapid that the arc duration can be reduced to one half-cycle of current. The higher the electrostatic capacity of a circuit the slower the rate of rise of the re-striking voltage.

Impulses cause breakdowns due to high voltage and to local concentration of voltage resulting in a great potential difference between parts normally at about the same potential and so not highly insulated from one another.

An impulse usually rises to full voltage in less than five micro-seconds and then falls away, the total time being from 50 to 100 micro-seconds. If the discharge flashes over an insulator before attaining maximum value (say three micro-seconds) it dies away quickly, resulting in a "chopped wave" which gives rise to higher voltages between end turns but to less severe oscillation in the body of the winding.

The distribution of impulse voltage depends upon the electrostatic capacity of the windings to one another and to earth. Its value can be reduced by arranging the windings in concentric layers with a voltage shield connected to the h.v. terminal, the whole forming a number of condensers in series among which the impulse voltage is divided, or by fitting shields so as to make a capacity coupling with the various parts of the winding in proportion to their normal voltage, which again avoids momentary concentration of voltage.

The two chief causes of surges are switching and lightning. Opening a circuit-breaker may produce a momentary voltage rise of twice the normal, but the energy associated with it is generally small and is soon dissipated.

With lightning, however, the voltage is almost without limit and the current may reach 200,000 A. Only a direct stroke causes damage, and an overhead guard wire forms a Faraday cage; this must be well earthed, as a resistance of a tower to earth of ten ohms will cause the voltage on the tower to rise to one million with a current of 100,000 A, causing a flash-over from tower to line.

Spark-over values of the line insulation should be below that of the connected apparatus in order to deal with impulses arriving from other parts of the line. An arrestor should be designed to prevent a power arc following the impulse.

If the neutral point of the system is earthed through a reactance or Petersen coil, a flash-over between one phase and earth will initiate a power arc, which will earth the system at that point. The increase in the voltage to earth of the other two phases will give rise to a capacity current through this earth point ordinarily enough to maintain the arc.

The voltage of the neutral point also rises, and causes a magnetising current to flow through the Petersen coil. These currents will be approximately in opposite phase, and if made nearly equal will give a resultant current at the earth point insufficient to maintain the arc. Consequently it will go out and the system will be restored to its normal state. Another method of conducting the lightning stroke to earth and preventing the power arc from following is to enclose the spark-over gap in a tube containing openings through which the gases from the power arc escape, and in doing so form a blast which effectively extinguishes the arc. These expulsion gaps can be used in systems where the neutral point is earthed.

* * *

Solving Electricity Supply Problems

Reviewing experience of the past ten years in his inaugural address as chairman of the North-Eastern Centre of the Institution of Electrical Engineers at Newcastle-on-Tyne on October 14th, Mr. F. C. Winfield (an account of whose career appeared in our last issue), explained how cable research, by making impregnation continuous in actual service, has effectively eliminated voids, and permitted cable voltages to be raised to 220 kV. The success of the oil-filled cable can be judged by the fact that although the length installed during the past five years is probably not less than fifty miles at 66 kV and thirty miles at 132 kV, and rather more abroad, to his knowledge, there had never been a single electrical failure of this type or of its associated joint boxes.

The dielectric strength of oil-impregnated paper itself places an ultimate limit on the design of cables along present lines. This limit is about 300 kV, unless some improved medium is found. Cable joints and sealing ends are the weakest parts of any cable system. Up to 22 kV troubles with these are now rare, but at higher voltages, excluding oil-filled cables, they are many and serious. There is evidence that the cause is appreciated and that the troubles will in future be much less frequent.

Regarding overhead lines, lightning has proved the most serious difficulty. A recent statistical inquiry in this country, although covering a period of only two years, suggests that lightning outages per mile are inversely proportional to line voltages and, as the average line section length is roughly proportional to line voltage, the conclusion is that lightning outages per line section are roughly independent of line voltage. The examination suggests that on an average we can expect one outage per line section every five years whatever the voltage of the line. This statement must be accepted with caution, as it covers too short a period and lightning is not evenly spread throughout the country. Further, the use of double circuit lines for duplicate supplies introduces a slightly increased hazard, since there is considerable evidence to suggest that something like half of the total outages are related to high tower footing resistance, and that this type of outage may affect both circuits of a double circuit line simultaneously.

It is probable that lines of 250 kV and upwards will show considerable immunity, as there is evidence to suggest that the voltage of most lightning effects is below the breakdown value of normal insulation for a 250-kV line.

It was possible in something like 85 per cent. of the total outages recorded to return the line to service immediately, while of the 85 per cent. about half only called for repair work afterwards. This indicates the value of auto-reclosing switchgear as one method of attack on the lightning problem and even other causes of overhead line outage. Unfortunately auto-reclosing cannot yet be applied where questions of synchronism arise.

Notable developments are now taking place in the direction of high-speed switching and relaying which may reduce the maximum time of fault interruption in the worst case to, say, a fifth of a second.

To-day most new high power switchgear is fitted with arc control devices. When correctly designed and applied there does not appear as yet to be much to choose among the several available forms, but the testing experience which has been gained points to the extraordinary danger of simple extrapolation of data in producing new designs. It is not too much to say that at the present time complete reliance cannot be placed on any circuit-breaker unless the type has been submitted to real tests.

The present tendency to include fault testing only if called for by the buyer and to charge heavily for it is, in Mr. Winfield's view, a wrong policy. He considers it to be the manufacturers' duty, now the means exist, to sell only proven types of gear. Appreciation of the dangerous condition of many existing switchgear installations is leading to wholesale surveys which may be expected to produce much modification and replacement during the next few years.

The time has come to change our outlook and, considering generating stations more as belonging to the major transmission networks, dissociate them from direct connection with distribution networks. The present association of generating plant with distribution centres is costing many thousands of

pounds to-day. Except in special cases, all future generating stations will switch at 33 kV, or above.

Other things being equal, generation should be at the switching voltage, since this eliminates the step-up transformer and should result in simplification, lower capital costs, higher efficiency, and perhaps reduced switching duty.

There is a dearth of inland sites with sufficient condensing water. The use of cooling towers reduces efficiency by 5.5 per cent. and it is undesirable to increase voltage for transmission from coastal stations. Therefore, Mr. Winfield visualises the pure base load of the country being carried by large, completely reliable, super power stations of the present type employing still larger, cheaper and more efficient generating units and supported by a series of much smaller stations, of say 60,000 kW installed capacity, built on selected coalfields and normally operating on a one- or two-shift schedule.

These secondary stations would be designed primarily for simplicity and low capital cost rather than ultimate reliability. They could be financed jointly by the supply authorities and the colliery owners, or by the supply authorities alone with long-term agreements for low-grade coal delivered direct from colliery washing plants into the power station bunkers. Site works, coal storage, and spare plant would be reduced to the minimum. In this manner both the capital and coal costs might be reduced in favourable examples to a degree sufficient for economic justification. Some natural water for make-up might be supplemented by water pumped from the mines.

Such a scheme, if practicable, would have many advantages and also be a possible solution of the peak load plant problem. Mr. Winfield emphasises, however, that the economic justification for such secondary stations depends essentially on insistence on a rigid point of view in design. The size of 60,000 kW is chosen deliberately as representing a typical grid unit, and permits such a station to be treated as of no more importance than one of the generating sets in the prime base load stations. This outlook permits the design of a station low in capital cost, by eliminating provision for extension, spare plant, large site works, and special arrangements to increase reliability. Given favourable circumstances, it is on capital savings of this type and on savings in coal transport charges to offset loss of efficiency that the proposal depends.

* * *

Coast Radio Stations

The paper on "Radio in Relation to Shipping" by Mr. A. J. Gill, of the engineer-in-chief's office, General Post Office, which was read before the Institution of Engineers and Shipbuilders in Scotland on October 22nd describes the equipment and services of coast (ship-shore) stations of which two are in Scotland, two in Ireland, and seven in England. To comply with the provisions of the Washington convention (abolishing spark working) the equipment has been completely replaced during the last three years by new valve transmitters. The normal range is about 300 miles, and ships off the coast of the British Isles can always get into touch with at least one station and generally with two or more. During 1934 the traffic handled by the Burnham station exceeded 2,000,000 words, over half of which was carried by the long distance (short wave) service. Traffic can be handled on the short-wave service from ships in any part of the world, with the possible exception of certain parts of the Pacific. One day's work of the British coast stations represents the exchange of messages with 1,472 ship stations.

New radio telegraph equipments are almost all of the interrupted continuous wave or continuous wave type of about 1.5 to 2 kW input in the largest cases, with wavelengths of from 2,400 m. down to 15 m.

Impressing the Consumer. By Mabel G. Reading

Salesmen and the I.E.E. Regulations : The best-liked tariff

THE section of the tenth edition of the I.E.E. Regulations that deals with the earthing of all electrical apparatus is, I am convinced, of supreme importance to all concerned in the electrical industry and also, more especially, to the layman. Any salesman or saleswoman who can give a definite explanation of the new regulations to the entire satisfaction of the person concerned should make a good impression, and orders will follow, possibly necessitating a change in the existing wiring and connectors to the earthed type.

It is annoying to the consumer to be informed that his wiring does not comply with the present regulations and that it is now not permissible to install any metal apparatus in the home unless it is to be used with three-core flexible cord and a three-pin earthed plug. Some tact is required in order to convince the consumer that the rule has been made entirely for his safety and to persuade him to have the necessary work carried out. It must be apparent to the technical man and to the layman alike that it is a very desirable rule, providing that all wiring work is done by a reputable contractor.

Simple Statement Necessary

The reason for earthing electrical apparatus should be explained in a simple manner, the consumer being made to realise that, should a fault occur on any of his apparatus, the earthed connector will conduct any escaping electricity to the earthed plug, thus eliminating the possibility of an electric shock being received by the user of the apparatus. This feeling of additional safety should not be difficult to engender if the salesman enumerates the many improvements in design and manufacture in the present appliances and also stresses the several years' guarantee which is given in almost every case. Such a statement should result in a very favourable attitude on the part of the purchaser. Taking the long view, it must follow that consumers will be more than willing to install suitable wiring in their homes, incorporating more outlets for the use of additional appliances, which their families will use feeling convinced of the infallibility of the new installation and of the earthed appliances.

With no desire to create inhibitions in the public mind the industry must be prepared to face facts, and because it has been found desirable to formulate these new rules saleswomen and demonstrators must co-operate, determined to continue the good work which the Institution of Electrical Engineers has started.

In a lecture given on behalf of the Institution in April last Miss Caroline Haslett strongly advocated that only wiremen whose work had been proved thoroughly satisfactory and who held some distinguishing badge should be permitted to carry out electrical contracting work. Surely this is a necessary improvement which should come about in the near future.

Talks with consumers residing in many of the electricity supply authorities' areas around London have corroborated my view that the rateable-value system is easily the most popular and the best understood. It impresses the house owner or occupier as being a fair method of charging and gives him definite encouragement (if the "unit" charge is small, say ½d. or 1d.) to use more electricity. Psychologically it makes an appeal, as it is much more convenient to use one source of supply from one meter at a definite fixed charge plus the rateable value of the house for lighting, heating and all domestic purposes. The consumer is then able to assess fairly accurately the cost of his electricity per annum. (The subject of tariffs is dealt with in a comprehensive manner in the Electrical Handbook for Women, Chapter 8).

An Incentive to Purchase

The reduction in the price of electrical appliances during the past two years has proved a great incentive to the buying public, and statistics published by manufacturers show that sales have increased by almost 50 per cent. It is gratifying to observe that apparatus carrying from two to five years' guarantee and manufactured by leading British firms has been so much reduced in price without suffering in any way in workmanship; in fact, in practically all cases, design and finish have been definitely improved. A nickel-plated iron carrying a five years' guarantee, fitted with thumb rest, stand and three-core flexible cord may now be purchased for 8s. 6d.; similarly, a two-pint aluminium safety kettle carrying a two years' guarantee costs only 19s. 6d. A nickel-plated toaster, automatic and really well designed, is priced as low as 17s. 6d. Heat and comfort may now be enjoyed by all, as a bowl fire with a substantial copper reflector costs only 7s. 6d., and a 1-kW fire, guaranteed to comply with all the regulations, may be bought for 9s. 6d.

As to labour-saving, manufacturers have created a real demand with their low-priced vacuum cleaners, and the public may choose the outside bag or totally enclosed type at prices ranging from 6½ guineas. Demonstrators in showrooms will realise that their consumers are unable, in many cases, to expend more than this sum on a cleaner. It is only necessary to read the yearly report of one large British supplier to understand the reason for placing so inexpensive an article on the market.

This side of the story very definitely benefits the "man in the street," but salesmen must strive harder than ever to justify their position by showing an increase on their sales. It is expedient for us all to be a little more enthusiastic if we are to make 1935 a Jubilee Year for our electrical industry.

Electricity at the Motor Show

A number of new applications

FOR several reasons electrical manufacturers can claim a higher proportion than usual of the improvements to cars and accessories at the Motor Exhibition now being held at Olympia, London.

In the first place the introduction of the speed limit has resulted in a crop of warning and controlling devices, notably the "Thirtilite" and "Thirtilarm" audible speed signals made by Messrs. S. Smith & Sons (Motor Accessories), Ltd., and an intermittent flashing model (Cooper-Stewart Engineering Co., Ltd.) which can be fitted easily to any type of speedometer. Cooper-Stewarts' also have a dual petrol gauge and ammeter which gives audible and visible signals when the petrol is running low.

Improvements in ignition and lighting equipment are too numerous for us to attempt to describe in detail and at practically every stand goods are either cheaper or better value than last year. Many new types of fog and anti-dazzle lamps are available, and for use in "silent" zones Messrs. Joseph Lucas, Ltd., are marketing a switch for steering column mounting which enables the headlamps to be used in the same way as a horn. Short-circuit and overload troubles can be largely overcome by the use of the "Pol" mercury cut-out (S. Guiterman & Co., Ltd.), which, after operation, can be put into service again by a slight tap.

Next month Messrs. S. Smith & Sons (Motor Accessories), Ltd., will be able to supply their new "Parklite" clock which will switch on the side and rear lamps at a predetermined time. The same company is also making an illuminated mirror clock for fitting in the roof of a saloon car. For warming cars Messrs. R. M. Papélian, Ltd., have a new type of "HaDees" heater which incorporates an electric fan to distribute heat from the radiator water system. It extends only 5 in. into the car and a switch and patented deflectors give complete temperature control.

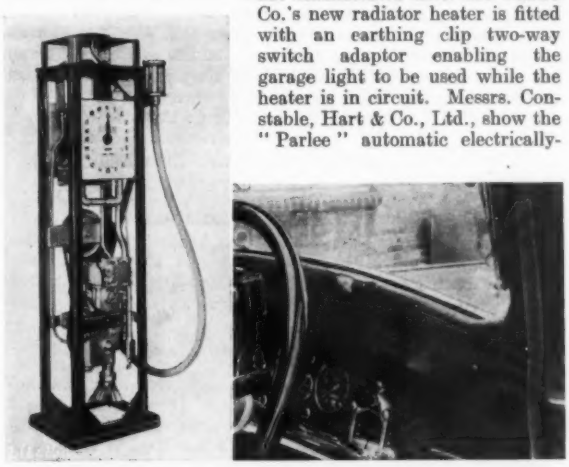
Fans are now used to prevent and remove mist from windscreens and a new type of electric frost screen, the "Nordland," is shown by Messrs. Thos. P. Headland, Ltd., which heats up in 3-5 minutes. One, two or all three of the horizontal wire elements may be switched on by a control on the windscreen, an indicator showing the number of elements in circuit. The screen does not interfere in any way with vision and the temperature created is not sufficient to involve risk of cracking the glass.

Following the recent Ministry of Transport regulations the "trafficator" semaphore type of direction indicator is standardised on practically every make of car, and several new models make their appearance. With the "Trico-Tell-Turn" positive action indicator the control knob (containing a pilot lamp) replaces the gear lever knob. New Lucas "trafficators" have moulded arms, and the pilot light in the control switch will not operate if the lamp in the arm is faulty. More cars are being fitted with twin horns.

Though there are no sensational new features to report, batteries generally have been improved or modified to meet present-day requirements. The Chloride Electrical Storage Co.'s range of "Double-Life Exide" batteries has been considerably extended and a new product is known as the "Buoyed Power" motor-cycle battery fitted with balanced helical springs placed on the mounting bolts to cushion the battery from the frame of the machine and protect it from extreme vibration. Another Chloride exhibit, the "Monobloc" battery, has moulded multi-compartment containers for running-board or chassis mounting. The new "super-armoured" batteries of the Young Accumulator Co. (1929), Ltd., and the Fuller Accumulator Co.'s "Double Blue" batteries with ebonite and wood separation, as well as batteries with triple separators, are shown for the first time. Other battery exhibitors include Messrs. Oldham and Son, Ltd., Britannia Batteries, Ltd., the Tungstone Accumulator Co., Ltd., and C. A. Vandervell, Ltd. The Henley "Vanguard" tyres make their first appearance at the Show.

Mann Egerton cleansing tank

Lissen, Ltd., is now marketing a range of torches, and for eliminating danger of fire and for current economy Ceag, Ltd., has the "Lumax" transformer inspection lamp particularly suitable for garages and workshops. The small model of the "Anglepoise" lamp (Herbert Terry & Sons, Ltd.) has innumerable uses. The Desmo Co.'s new radiator heater is fitted with an earthing clip two-way switch adaptor enabling the garage light to be used while the heater is in circuit. Messrs. Constable, Hart & Co., Ltd., show the "Parlee" automatic electrically-operated garage door opener, which was described in the ELECTRICAL REVIEW of June 28th last.



Gilbert and Barker "TC Trumeter" petrol pump skeleton and the "Thirtilite" dashboard-mounted indicator (S. Smith & Sons (Motor Accessories) Ltd.)

Garage and service station proprietors who wish to be up to date can discover plenty of ways in the Garage Equipment Section. "If your depôt is lighted they stop and buy" declares an effective model on the stand of Messrs. Benjamin Electric, Ltd., who are showing the new "Ile" reflector fitting and also "Duoflux" floodlights adapted for use with electric-discharge lamps. The "Tunnel" type tubular heaters (Bertram Thomas) are very suitable for garage heating.

Many new types of electric petrol pumps have put in their appearance since last year. The Wayne Tank & Pump Co., Ltd., S. F. Bowser & Co. (London), Ltd., Beck & Co., Ltd., and Avery-Hardoll, Ltd., all have new pre-set models, and a feature of the Gilbert & Barker "T.C. Trumeter" pump (shown by Stemco, Ltd.) is a motor with a "Thermoguard" automatic overload device.

Among a host of new air compressors is a two-stage model by B.E.N. Patents, Ltd., and new tyre pumps include products of the Dunlop Rubber Co., Ltd., Bristol Pneumatic Tools, Ltd., and Ingersoll-Rand Co., Ltd. Tangyes, Ltd., who also show compressors, are exhibiting "V.C.I." Diesel generating plant for garage lighting, etc. The display of Tecalemit, Ltd., includes an electric four wheel brake tester besides varied types of lubricators, one of which is the "Lubrostat" thermostatic oil valve designed to pre-lubricate cylinder walls with a decreasing flow as the engine warms up.

An improved type of remote recording apparatus is now used for the "Bendix-Cowdrey" brake-testing equipments. Crypton Equipment, Ltd., have a new speedometer tester and Messrs. E. P. Barrus, Ltd., a new compression tester.

For cleansing and reclaiming waste oil taken from engine sumps a filtration apparatus is marketed by Messrs. R. Cadisch & Sons. High-pressure car washers of the rotary gear type are a new product of Messrs. Alfred Diggle & Co., and Messrs. Mann, Egerton & Co., Ltd., display an electrically operated garage pressure cleansing tank for cleaning articles with paraffin.

Among service aids shown by Messrs. F. J. Gordon & Co., Ltd., is the "Rottler" cylinder boring bar, the "Arenco" bar by Messrs. V. L. Churchill & Co., Ltd., also being a new product. The "Suprema" bar (R. H. Cook & Co., Ltd.) has a 2¼-5 in. range. Grinders, polishers, drills, etc., of new design are shown by Grimstone Electric Tools, Ltd., Black and Decker, Ltd., Rotax, Ltd., Desoutter Bros., Ltd., and S. Wolf. The "Magnaflux" detector (Equipment & Engineering Co., Ltd.) for the testing of iron or steel for cracks and flaws has been improved.

Of interest among new battery chargers are a four-circuit Tungar model by the Edison Swan Electric Co., Ltd., and several types by Messrs. F. C. Heayberd & Co., Ltd. Both Philips Industrial and the Westinghouse Brake & Signal Co., Ltd., have home charger models.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication.

Corporation and Contractors at Croydon

It does seem a pity that your two correspondents, Mr. R. Illingworth and "Saleng" venture to criticise the policy of the E.C.A. without taking the trouble to find out what it is.

I am anxious to make it quite clear that the E.C.A. welcomes all reasonable steps to extend the use of electricity and has never objected to the schemes of simple hire in operation at Croydon or any other part of the country.

London, W.C.1, *October 19th.* L. C. PENWILL,
Director and Secretary,
Electrical Contractors' Association (Inc.).

Ships' Electrical Installations

Since writing my letter under this heading in your issue of September 27th, Mr. Leivesley has very kindly sent me a full copy of his paper, which elucidates some of the points which were not clear in the abstract appearing in the ELECTRICAL REVIEW of September 20th.

As regards the points mentioned in Mr. Leivesley's letter in your current issue I think that most Diesel engine manufacturers would agree that difficulties associated with torsional oscillation have already been overcome. High piston speed is, however, another story, and I for one would be very interested to have further particulars of the 300-kW oil-engine generators running at 900 r.p.m. stated to be suitable for marine service.

An average sea load of 1.5 kW per person is by no means a high figure, and in the case of a refrigerated cargo vessel with electrically driven refrigerating machinery the figure may be as high as 3 kW per person. The fact is that there are so many variables that it would be very difficult to fix any clear connection between the number of persons on board and the average sea load.

As regards the question of aggregate auxiliary plant, I now gather that Mr. Leivesley's statement intends to convey that the plant required for an electrically propelled *passenger liner* is roughly twice that required for a Diesel-driven cargo vessel of approximately the same length. This may be correct under certain conditions, but under these same conditions it would be equally true as a comparison between a Diesel-propelled passenger liner and a Diesel-propelled cargo vessel.

I may say I have read Mr. Leivesley's paper with great interest, and congratulate him on the care which he has taken in collecting so much interesting information.

Belfast, *October 21st.* FRANK JOHNSTON.

Illumination Values

The second comma which appears in the last sentence of my letter in your issue of October 18th was not in the original. It makes me appear to oppose all high intensities of illumination, instead of opposing only those which cannot be justified by the task to be performed. By the word "justified" I mean a properly conducted test of output or working efficiency in relation to economy.

The real test of Mr. Grant's installation will come when the stores manager compares his sales with his quarter's electricity bill. T. N. RILEY.

Radlett, *October 21st.*

[The sentence to which Mr. Riley refers should have read as follows: "May I reiterate that I am not arguing in favour of low intensities of illumination, but against high levels which have no real relation to the task to be performed."—EDS. ELEC. REV.]

Heat-storage Cooking

THE introduction by the General Electric Co., Ltd., to a number of North Country supply engineers at Manchester on Tuesday of the new "Heatstor" all-storage and semi-storage cookers represents, we think, the first major attempt in this country to place heat-storage cooking equipment definitely on the market as a commercial proposition.

The G.E.C. semi-storage cooker

These latest models were shown at this year's British Industries Fair and described in the ELECTRICAL REVIEW of May 24th (p. 744), but the company is now obviously anxious to dispel any idea that they are merely experimental equipments, an idea which had been associated with previous development models shown from time to time at the same exhibition in past years.

Both Mr. O. W. Humphreys and Mr. D. G. W. Acworth, who spoke on the development from the technical and commercial points of view, respectively, emphasised that the new cookers were really commercial equipment. The main arguments put forward seemed to be designed to convince the supply engineer that if he is really out to capture the cooking load then a time must come when the cooking peak will be a major problem.

Against the 400,000 electric cookers now in service there were 7,000,000 gas cookers, said Mr. Humphreys, and referring particularly to rural work he said that so long as individual overall cooker loadings were about 6 or 8 kW a very large possible field of development would be closed to the industry. He urged that special storage-cooking tariffs should be instituted and so arranged that the running cost to the consumer would be no more than that of an ordinary cooker.

To show the storage cooker in a light favourable to the supply undertaking the speaker stressed the possible overall saving by way of reduced grid kVA charges and distribution costs. The semi-storage model, for which he predicted the biggest future, represented an increased consumption of 730 kWh per year for six persons and 1,280 kWh per year for four persons, based on the generally accepted idea of one kWh per person per day for ordinary cookers. At a grid unit charge of 0.185d. per kWh those figures represented extra costs to the supply undertaking of 11s. 3d. and 19s. 8d., respectively.

Now, if the grid maximum demand charge were £3 10s. per kVA, the saving on the m.d. charge alone would amount to 11s. 3d. and 19s. 8d., respectively, if changing to storage cookers reduced the contribution to the peak per cooker by 0.16 kVA (six persons) and 0.28 kVA (four persons), when the saving in distribution costs would represent all extra profit. If the reduction in distribution costs equalled the reduction in m.d. charges then the supply undertaking would be "all square" if the storage cooker reduced the contribution to the peak by 0.08 kVA (six persons) or 0.19 kVA (four persons).

The semi-storage cooker is intended for use where diversity can be allowed for, and the four-position rotary switch was stressed as a special feature. The positions serve as follows: "Normal," block-heating elements only; "Grill," two grill elements only (1,500 W.); "Oven on full," one grill element and two oven bottom elements (1,950 W.); "Oven low," one oven bottom element only (600 W.).

Similarly, as its outstanding feature, the air gap between the lower (higher temperature) storage block and the upper (lower temperature) block was stressed in the case of the all-storage cooker.

Referring to the greater cost of a storage cooker, Mr. Acworth pointed out that the lower cost of maintenance meant that actually the equipment was no more expensive than an ordinary cooker. He also asked why special tariffs should be given for storage water heating and not for storage cooking.

Some observations were made by a few of the supply men present. Mr. W. Fennell (Mid-Cheshire Electricity Supply Co.) suggested some form of thermostatic control of the top block and said that a great advantage of the storage cooker was that the "lost heat" kept the kitchen warm and permitted clothes airing on top.

The 100 per cent. load factor appealed to Mr. J. Purrett (Lancashire Electric Power Co.) but he had found it difficult to get consumers to accept this type of cooker. He had in some cases offered it with supply and maintenance at £7 10s. per annum.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Thermal Switch

The "Tempat" thermal switch is designed either to make or break a circuit at a predetermined temperature. It consists of a vacuum tube in which mercury is normally retained at one end by a wax seal with a fixed melting point. When the temperature is reached the wax melts, releasing the mercury, which "shorts" two tungsten wires protruding through the wall of the glass tube, and either makes or breaks the circuit, according to the way in which the "Tempat" is arranged.

Resetting is accomplished by heating the tube slightly above the normal operating temperature so that the wax melts or floats on top of the mercury, the latter being returned to its normal position. The tube is allowed to cool, and the switch is then ready for use again. This process can be repeated indefinitely. The temperature setting range is from 40 deg. C. to 130 deg. C., in steps of 5 deg., higher temperatures being arranged for to special order. The switches are supplied suitable for from 3 to 15 A at 250 V, the smallest tube being 1¼ in. long and ⅜ in. in diameter, and they are obtainable from MR. ALAN WRIGHT, Grand Buildings, Trafalgar Square, London, W.C.2.

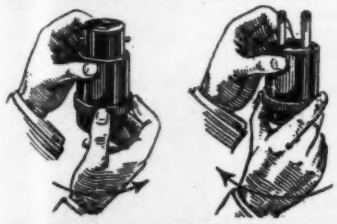
Mild Steel Gilled Tubing

A new departure in mild steel gilled tubing, with advantages for heating, cooling, humidifying and air-conditioning is the "Harco" hot-shrunk tapered gilled tube. It has no crimp and is twice as wide at the bottom of the gill as at the outside edge, the cross section of the strip being tapered. The gill is wound on the tube at a cherry-red temperature and in cooling shrinks tightly on to the tube. Contact between gill and tube is thus perfect, there being no crimp with cavities in which dust and moisture can lie and rust the root of the gill. Efficiency or rate of heat transfer is approximately 25 per cent. greater than for a crimped tube.

The tubes are manufactured by MESSRS. G. A. HARVEY & CO. (LONDON), LTD., Woolwich Road, London, S.E.7, and can be supplied with plain, screwed or flanged ends in lengths up to 22 ft., from 1¼ in. to 4½ in. outside diameter of tube with gills approximately ½ in. to 1⅞ in. deep and varying in pitch from 14 to 48 gills per foot, according to diameter of tube. They can also be supplied built up into heating and cooling units, with welded joints, which have been tested up to 2,000 lb. per sq. in.

A Plug-adaptor

Various methods have been adopted to secure interchangeability between lampholder adaptors and two-pin plugs. One of the latest is that of MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, 6, who have introduced a combination that is converted by turning the moulded cap, which has a milled edge for the purpose, thus causing the two plug pins to protrude or be withdrawn. There are no loose parts or springs, and the projecting tongue in the adaptor contact ensures that the two pins make good contact. The adaptor is obtainable in brown, walnut, or ebony bakelite.



The "Presto" plug-adaptor in both positions

A Motor Car Engine Heater

MESSRS. GEO. BRAY & CO., LTD., Leicester Place, Blackman Lane, Leeds, 2, have informed us that the shape of their motor car engine heater has been altered to facilitate fixing to certain engines, while an armoured flexible cable and plug socket for fixing to the steering column can be provided as an extra instead of the heater being connected directly to the house socket.

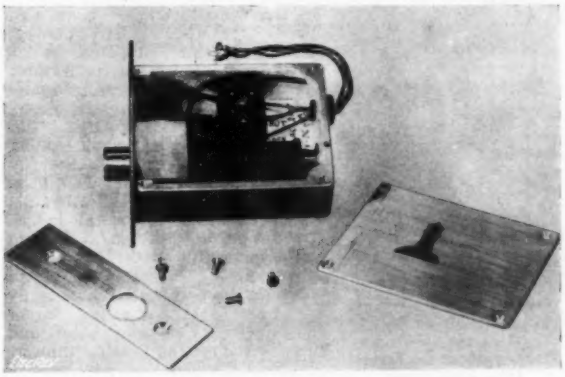
Shop-window Reflectors

The latest catalogue issued by ROWLAND'S ELECTRICAL ACCESSORIES, LTD., Hockley Hill, Birmingham, 18, entitled "Realumination" contains details of new shop-window reflectors known as "Raked Realites." The shape of the reflector is such that the light is thrown downward and forward so that there is no "back-glare" from the window, enabling the reflector to be hung in the normal horizontal position without tilting. Models are available with one or two lights, and heavy-gauge sheet-steel with electrically welded joints is used.

There is also the "Realaylite," which is claimed to be the first universal fitting laylight. The unit can be fitted to any ceiling where the joist spacing varies from 14 in. to 17 in. and the head room between the ceiling and the floor is not less than 8 in. The standard type comprises a specially constructed "Realite" reflector unit with fixing ears and a bottom cover glazed with flashed opal glass, the work of installing being reduced to cutting a 14 in. square hole in the ceiling, screwing the reflector unit into position and fixing the bottom cover.

An Electric Door Lock

The "Sterdy" electric door lock marketed by MESSRS. W. C. DAVEY & CO., 176, Tottenham Court Road, London, W.1, consists of a cast aluminium box containing three small 8-V, 2-A solenoid coils. Two of them are placed horizontally



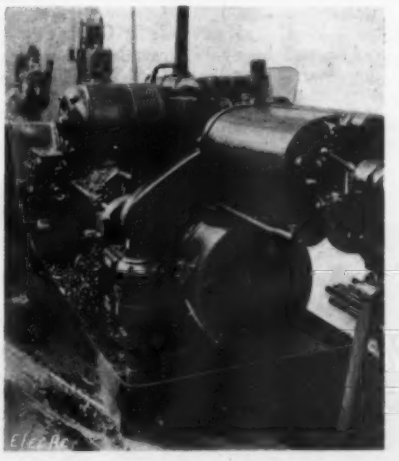
The "Sterdy" door lock

together in line, both acting on the brass locking bolt, the reverse end of which forms the solenoid plunger within the coils. One coil forces the bolt outward for locking and the other withdraws it.

The third coil is at right angles to the bolt at the forward end. It serves to lift a small gravity plunger which engages with a groove in the bolt, so unlocking it and enabling it to be withdrawn. Three wires are needed between the door lock and its key switch and source of supply, which may be a.c. or d.c.

Electric Machine Tools

Recent introductions by MESSRS. A. HERBERT, LTD., Coventry, include a 1¼ in. bar automatic machine tool and a No. 0 motor-driven plain milling machine with an all-electric gearless drive. The latter is a self-contained motor-driven machine for finishing large quantities of small parts rapidly and accurately. The spindle drive is by a ¾ h.p. four-speed (three-speed with 25-cycle supply) squirrel-cage motor, the rotor of which is mounted on the spindle. The machine is available for 2- or 3-phase, 25 or 50-cycle a.c. supply and for all voltages from 200 to 500. The main switch has an interlocked cover, and a fan mounted on the spindle in conjunction with protected openings in the end covers prevents overheating and the ingress of chips.



The Herbert 1¼-in. bar automatic machine tool

The 1¼ in. bar automatic machine tool is a single-spindle machine for high-speed production of work up to 4½ in. long, in either steel or non-ferrous metals. The headstock is driven by a flanged motor, bolted to the back and controlled by a push-button switch mounted at the front of the headstock. The power is transmitted to the spindle through pick-off gears and friction clutches, the final drive being through worm and worm gear.

The bar feeding mechanism is of a patented type which works without shock and without any tendency to over-feed the bar. It also embodies a special device by which the motions of the turret and cross slides are stopped when the

stock is used up and a red light indicates that new bar stock is required. The feed motion is driven by gearing and enclosed belt from the main spindle, and the feed box, bolted to the back of the bed, provides four automatic feed changes which are made by a series of adjustable pins in the circumference of the control drum, which is keyed to the camshaft at its extreme right-hand end. The motor and starter are rated at 200-550 V, 2- or 3-phase, 25 or 40-60 cycles, a.c. supply although d.c. models can be supplied.

New Cooper-Stewart Equipment

Thumb control, giving instantaneous switching to any of the three positions, "hot," "off," and "cold," has been incorporated in a new hair-dryer manufactured by the COOPER-STEWART ENGINEERING CO., LTD., 136-7, Long Acre, London, W.C.2. An improved motor is also used, as well as a fan with larger blades to give more draught. The apparatus is chromium-plated, with a bakelite handle, the loading when supplying hot air being 500 W.

Cooper - Stewart metal-type hair dryer

The latest "Shearmaster" (Model 31), another product of this company, has a much longer and more comfortable handle than the old type. Besides being designed for both sheep-shearing and horse-clipping, it has a special attachment which enables it to be used as a drill. An easily operated thumb switch has been incorporated in the bakelite handle. The machine has an overall length of about one foot, weighs 3 lb., and has a loading of 65 W.

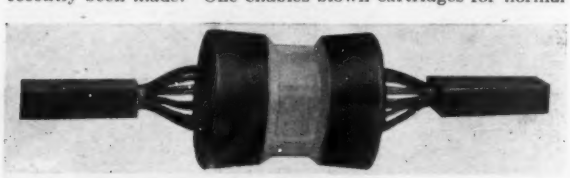
By the incorporation of a porcelain support rod the company has been able to utilise larger elements in its electric toaster, and thereby reduce the heating time by about 40 per cent. A new type of heating tube suitable for boiling plates, kettles, brewing and baking equipment has been developed for water heating. Tests show that with a 2-kW length 11 gal. of water can be heated from cold to 90 deg. in 40 min. With 3-kW the time taken is 25 min., and with 5-kW 15 min. The element itself is a spiral form, and after being inserted in the outer metal covering has a liquid insulating material pumped in. When the insulating material has set the tube can be bent into any shape to meet individual requirements. The tube can be supplied with loadings of from 20 W to 15 kW.

Protecting Aluminium

For a number of years the bonderizing process has been used for the protection of steel, and to facilitate the application of paints. For the same purpose the PYRENE CO., LTD., Great West Road, Brentford, has introduced the "Pylumin" process for aluminium. It is claimed to be so simple in operation that it can be handled entirely by unskilled labour, and capable of producing a coating which, in addition to being protective, forms a cohesive bond for paint, lacquer and enamel finishes. Parts to be treated are merely immersed in a boiling solution made up of "Pylumin" powder, and water.

Heavy-duty Cartridge Fuses

Although heavy-duty rewirable cartridge fuses are not a new development for MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, two important constructional improvements have recently been made. One enables blown cartridges for normal currents of over 100 A to be rewired at the works and reissued as factory-tested cartridges at half the cost of new ones. The other improvement consists of an alteration of the fusible element so as to give cooler working and better short-circuit performance than the earlier patterns. The fuses are made rated at up to 700 A at 660 V.



The Reyrolle rewirable fuse

Fire Detection on Ships

The "Meech" patent strip alarm is a novel system of fire detection described by MESSRS. ALFRED GRAHAM & CO., LTD., Caxton House, Tothill Street, Westminster, S.W.1, as particularly applicable to ships of all types. The detecting strip consists of paper ribbon, to the under-side of which is affixed a narrow fusible metallic alloy strip, which is protected by further paper ribbon. This strip is ¾ in. wide and 1/64 in. thick. One side is adhesive, so that it is only necessary to stick the strip on to the surfaces to be protected. Metallic continuity is assured by the use of special jointing clips similar to the buckle straps used for lead-covered wiring, which are hidden when covered with adhesive strip.

A small dry battery sends about 0.008 A through the strip, energising a relay which remains inoperative so long as the strip circuit is unbroken. Rupture of the circuit by fire melting the detector strip de-energises the relay, causing an alarm bell to ring and a red lamp to glow on the control panel. When the battery needs renewing a small green lamp on the control panel glows. Should this reminder be neglected the exhaustion of the battery will de-energise the relay and sound the main alarm. Accidental or other damage to the circuit is revealed in the same way.

The small dimensions of the detector strip and the ease with which it can be fixed enable it to be applied liberally and quickly. It can be obtained in various colours, or it may be painted or stained to match the existing decorations of the room in which it is installed.

Home Battery Charging for Cars

For the motorist who desires to charge his own accumulator PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have introduced a new small rectifier, type 1460, which is designed to work off 200-250-V mains at 50 to 100 cycles and charges either 6-V or 12-V batteries at 1.3 A irrespective of the state of the battery. Nine feet of braided flex is provided for the battery connection with a special non-reversible plug which engages with the fitting provided for mounting on the dashboard, or in any other convenient place on the car.

The Philips No. 1460 battery charger

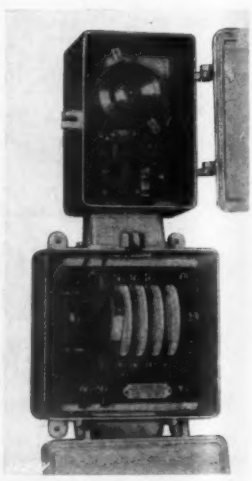
The charger can also be provided with an adaptor and special regulator lamp, permitting from one to three radio cells to be charged at ½ A. Black bakelite is used for the casing with plated fixing nuts.

Noise Suppressors for Radio Sets

MESSRS. BELLING & LEE, LTD., Cambridge Arterial Road, Enfield, inform us that they are placing on the market a 1-A set lead suppressor designed on the same lines as the standard ½-A type but intended for use with large wireless sets and radio-gramophones.

Relay and Time Switch

A new pattern of the "Sharborn" relay and time switch, made by MESSRS. H. J. OSBORN & SHARP, LTD., 18, Gibson Street, Glasgow, W.2, is known as type "V." It has been specially designed for pole, lamp standard, and street kiosk mounting and the dimensions are 18¾ in. long by 7¾ in. wide. Aluminium cases are employed, and they can be made watertight if necessary. The relay case has a cable entry at the bottom and a similar casting to the bottom cable entry is used as an adaptor between the relay and the clock case above. This casting may be drilled on either side for cable outlets.



The type "V" relay and time switch

Christmas Tree Lamp Outfits

A demand for Christmas tree lamp outfits has prompted the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, to introduce an inexpensive set of decorative lamps to compete with the imported sets which have been on the market during the last few years. This outfit is attractively packed and comprises twelve series-burning lamps in various colours, bakelite holders and adaptor wired complete. It is suitable for direct connection to 200/260-V mains. The larger "Osram" outfits, comprising eighteen lamps, are recommended for shop-window lighting, hotels, cinemas and dance halls.

Small Switches

Illustrated on page 577 is a display board comprising a range of "Safeways" electrical accessories. An interesting one is the three-way pear switch, the plunger of which moves a revolving knife-edge contact one-third of a revolution each time the switch is operated. "Off" is followed in turn by contact with each of two circuits. The switch is also used in conjunction with the "Either-Lite" two-way lampholder adaptor, which enables the switching of the adaptor to be remotely controlled. A standard two-way adaptor has a separate switch for each outlet. Brown bakelite is used in all cases for the casing, with red moulded push-bars and buttons. The manufacturers are MESSRS. PHILIP KNOWLES, LTD., 9, Domingo Street, London, E.C.1.

Responsibility for Mishaps.

By W. Summerfield, M.A., B.C.L., LL.B.

How a new Act affects contractors

THE Law Revision Committee appointed in January, 1934, to consider how far certain legal maxims and doctrines hallowed by long tradition required to be revised in view of modern conditions reported in July, 1934, in favour of alteration of the "doctrine of no contribution between tort-feasors." The Committee's recommendations have now been shaped into statutory form, Part II of the Law Reform (Married Women and Tort-feasors) Act, 1935, being devoted to the subject. That Act was passed on August 2nd, 1935, but—somewhat unnecessarily, it may well be thought—the operation of Part II of the Act is postponed until a date to be fixed by the Lord Chancellor. The Act, it should further be noted, does not apply, in any event, to Scotland or Northern Ireland.

An examination of some of the leading cases decided under the old rules will show not only the reasons prompting the reforms but also the significance of the new rules as now framed. The latter may be summarised as follows:—

(1) Where a person suffers damage as a result of a tort (*i.e.*, a civil wrong apart from contract) and recovers damages against one party (called a "tort-feasor," *i.e.*, wrong-doer) he is not precluded from proceeding against any other party who, if he had been sued, would have also been liable—as a joint tort-feasor.

(2) If more than one action is brought in respect of the same damage suffered, the sums to be recovered may not exceed in the aggregate the amount awarded under the first judgment. A plaintiff who brings more than one action, however, is liable to be deprived of his costs in all except the first one. Such actions may be brought on behalf of the injured party himself or for the benefit of his estate or of his wife, parent or child, and if the injured party be a married woman an action may be brought for the benefit of her husband.

(3) Any tort-feasor rendered liable may recover contribution from any other tort-feasor liable in respect of the same damage, except where the former is liable to indemnify the latter.

(4) Where contribution is demanded the Court is to fix the proportion of the loss to be borne by each party having regard to his share of responsibility for causing it; and the Court may, if it thinks fit, grant complete exemption to any particular party.

(5) Torts committed before the above rules become operative under the Act are not affected by them.

Existing Anomalies Illustrated

Under the old doctrine the party injured could proceed against any one of the joint tort-feasors and be awarded the full amount of his damage against him; thereafter, if that tort-feasor paid under the judgment he was not entitled to call upon the other parties jointly responsible with him to contribute their share. The rule thus differed markedly from that applicable where a party suffered loss through breach of contract committed by several contractors. Its anomalies have been frequently commented upon with disapproval by judges called upon to administer it.

Thus, Lord Herschell (Lord Chancellor) said of it that it appeared to him to be founded on no principle of justice or equity or of public policy, in *Palmer v. Wick and Pultneytown Steam Shipping Company* [1894], A.C. 318. In that case the House of Lords declined to apply the doctrine upon the facts; such circumstances may quite easily arise in a great variety of cases.

What happened in that particular case was that Palmer, a stevedore, was engaged in unloading cargo from a ship of the defendant company when a block which was part of the ship's tackle fell and killed one of his workmen. The family of the deceased brought actions against both the stevedore and the company and the actions were heard together; in the event, the jury found both the stevedore and the company liable, on the ground that the company had supplied weak tackle and the stevedore had been recklessly negligent in using such tackle, and they assessed the damages payable at £600. The company paid this sum, together with the costs amounting to £239, and then brought an action to recover one-half of this total from the stevedore; the stevedore resisted payment on the ground that he was a joint tort-feasor and could not be made liable to contribute.

It is not difficult to envisage cases where the "weak tackle" occasioning damage may be electrical equipment, or any kind of machinery or plant, or part of a building or structure; in such cases the liabilities of the supplier, engineer or builder, may be brought into controversy.

The old doctrine, established by the case of *Merryweather v. Nixan* [1799] 8 T.R. 186 was, indeed, tolerated for so long largely because of the ingenuity of successive Courts which devised means of engrafting exceptions on to the general rule, and drew rather fine distinctions as between one set of circumstances and another.

For instance, a contractor might be compelled to contribute where by the terms of the contract he had undertaken to indemnify his employer or the other party to his contract. Thus, in *Newcombe v. Yewen and Croydon Rural District Council* [1913], 29 T.L.R. 299, the District Council entered into a contract with Yewen (including an indemnity clause) which involved in the course of the work the making of an excavation by the side of a road; Newcombe fell in and sustained fatal injuries in respect of which a successful action for damages was brought by his widow and daughter (under the Fatal Accidents Act, 1846), and the Court held that the Council was entitled to enforce its indemnity clause against the contractor and that the indemnity recoverable included the costs of defending the action.

A distinction was drawn between cases where a tort-feasor was properly deprived of his right to be indemnified where he had engaged in an act manifestly wrongful and one where the tort committed arose in the course of the execution of a (legal) contract.

Some Electrical Instances

The Electric Lighting (Clauses) Act, 1899, Schedule, Section 77, provided that undertakers were to be liable in respect of all accidents and for all damages and injuries resulting from their act or default or the act or default of persons employed by them and to indemnify authorities and persons responsible for street repairs; it remained a matter of controversy as to whether such liability arose also where there was no negligence on the part of the undertakers or of persons for whom they were responsible.

In *Farnworth v. Manchester Corporation* [1930], A.C. 171, which went up to the House of Lords, the plaintiff recovered damages from, and obtained an injunction against, the defendants in respect of the nuisance arising from the emission of poisonous fumes in the vicinity of the plaintiff's farm from an electrical generating station erected by the defendants; the latter had pleaded that what they had done was executed pursuant to their powers under the Manchester Corporation Act, 1914.

The Charing Cross Electricity Supply Co. v. Hydraulic Power Co. [1914], 3 K.B. 772, was a case in which the defendants owned hydraulic mains laid pursuant to statutory powers, in streets under which the plaintiffs had laid electric cables. The plaintiffs suffered damage to their cables through the bursting of the defendants' mains at four places. No negligence could be fastened upon the defendants; two of the mains in question had been laid pursuant to an Act which did not contain a clause whereby the Act was declared not to exempt the undertakers from liability for nuisance, but the other two were laid under an Act comprising such a clause passed later. The later Act provided that the two statutes were to be read and construed together as one Act. It was held that in the absence of a statutory authorisation to commit a nuisance the liability extended even if no negligence were proved, and that the privilege subsisting for the undertakers under the first Act was abolished by the second statute.

This elaborate and bizarre roof lighting system was to be seen at the recent Paris Motor Show

The Canadian Electrical Industry

THE innumerable surveys and statistics available with regard to Canadian conditions allow a fairly accurate analysis to be made, and Mr. F. W. Field, C.M.G., H.M. Senior Trade Commissioner in Canada and Newfoundland, in his report to the Department of Overseas Trade on the economic conditions in Canada (Stationery Office, 4s. net), states that they indicate clearly that the progress made in 1934 was considerably more general than in the previous year, and that the Dominion's position is considerably better than a year ago, the outlook being for continued improvement. Certain United Kingdom industries—structural steel, for example—report a decline of their trade with Canada as being partly due to the strength of the "trade in Canada" movement, the effect of the growing purchases of "made in Canada" products being a factor in the curtailment of imports from the United Kingdom and possibly in the trading balance between the two countries.

The total value of exports of electrical apparatus from Canada was $2,131,000 in 1934, as compared with $1,317,000 in 1932, of which goods to the value of $268,989 were exported to New Zealand. The non-ferrous metals and products group recorded an increase in imports of $8 millions. Electrical apparatus was one of the commodities that contributed substantially to the larger total. Imports of electrical apparatus from the United Kingdom, however, fell from $1,021,000 in 1932 to $656,000 in 1934, while imports from the United States rose from $6,490,000 in 1932 to $6,835,000 in 1934.

The latest Canadian production figures are for 1933, when electrical apparatus and supplies were produced to the value of $37 millions. Motors, generators and transformers accounted for $10 millions; cables and conduits for $7½ millions; wireless instruments, $4½ millions; batteries, $4 millions; household appliances, such as vacuum cleaners, refrigerators, stores, &c., $2 millions.

The increasing use of electrical equipment in the home is noticeable. Sales of household electrical appliances during 1934 included 13,000 ranges, 25,000 refrigerators, 55,000 washers, 67,000 vacuum cleaners, and 2,500 ironers. These additions to existing domestic equipment have produced a corresponding increase in the consumption of electricity, while a further increase has also been contributed by the 14,090 homes newly wired for electricity during 1934, including 3,000 new rural customers. Electrically wired homes in Canada now totalled approximately 1,536,000. With an abundance of developed and available power, central stations are confronted with the problem of utilising this power in the best manner.

A helpful factor has been the use of electric steam generators to supply steam to industries at costs competitive with those of steam generated by coal. As a result, Canada now has electric steam generators with a total rating of over 1,500,000 h.p. Such plant is used, for example, in newsprint works and large departmental stores which have a high connected daytime load, for supplying heating and process steam at nights and on Sundays and holidays.

Sales of electric storage batteries in Canada during the last calendar year were valued at nearly $3 millions, and included 499,553 batteries for internal combustion engines, 14,243 cells for farm lighting, 2,734 cells for railway service, and 3,364 cells for motor cycle starting. Canadian manufacturers exported in the same period over $279,000 worth of batteries. Their most valuable markets are New Zealand and the Argentine Republic. Imports of batteries and parts were valued at $239,000. The trade is largely in the hands of Canadian manufacturers, including a factory operated by United Kingdom capital. A small amount of trade is obtained in Canada by one or two United Kingdom manufacturers, the value of imported U.K. batteries totalling $39,000. The tariff on imports of United Kingdom electric motors, generators, alternators and transformers is 25 per cent. *ad valorem*, less one-tenth of that rate if the equipment is shipped direct from the United Kingdom to Canada.

The imports of electrical apparatus in the calendar years 1933 and 1934 and the respective shares of the United Kingdom and the U.S.A. were :—

Canadian imports of	From all countries.		From United Kingdom.		From U.S.A.	
	1933.	1934.	1933.	1934.	1933.	1934.
	$	$	$	$	$	$
Storage batteries ...	113,423	148,672	38,809	34,091	74,489	114,420
Dynamos, generators	393,818	264,633	18,006	32,948	118,859	216,672
Electric light fixtures	144,557	244,991	11,466	9,540	124,121	217,171
Incandescent lamps (number)... ...	1,354,274	1,734,996	4,613	948	847,218	1,291,306
Motors	595,072	1,061,497	116,211	184,171	468,937	832,222
Sparking plugs, etc.	187,891	283,777	18,442	10,760	166,367	269,598
Switches, etc. ...	302,816	441,106	30,980	51,079	270,639	385,122
Telephones	202,778	352,878	27,706	35,174	173,660	314,406
Transformers ...	51,390	76,648	22,203	25,451	28,372	49,434

The sales of wireless receiving sets last year numbered 167,177, valued at $7,344,635, as against 130,493 sets valued at $5,383,846 in 1933. The total imports in 1934 were $1,641,725, of which $85,466 came from the United Kingdom and $1,553,680 from the U.S.A. The total imports of radio valves in the same year were valued at $155,271, of which practically all came from the U.S.A. The expansion of the Canadian industry is likely to reduce the amount of imports, and there appears to be little prospect of increased trade for the United Kingdom in this industry.

No new large power undertakings were initiated in 1934. Work was continued on several developments already under construction, and installations, aggregating 214,965 h.p., were brought into operation during the year. This brings the total installation for the Dominion to 7,547,035 h.p. The recovery in power demand remarked in 1933 gained in momentum during 1934, and the records of electrical output compiled by the Dominion Bureau of Statistics indicate that the total output for 1934 was greater than in 1933. This expansion of output is principally due to increased domestic, commercial and industrial demand and not to increased export or use in electric boilers. The gain is most pronounced in the province of Quebec. The Dominion Water Power and Hydrometric Bureau estimates that there is available water power totalling 20,347,400 h.p. under conditions of ordinary flow and 33,617,000 h.p. usually available for six months of the year. Of Canada's total hydraulic installation 87.3 per cent. represents installations in central electricity stations, *i.e.*, the power developed for the sale of electricity to meet the general industrial, commercial, municipal, agricultural and domestic demands of the public. Pulp and paper mills accounted for 8 per cent. of the total and installation for other purposes 4.6 per cent. It is estimated that 80 per cent. of Canadian industry is operated by hydro-electric power.

Preston, Lancs., is one of the first towns to adopt the new Siemens "Sieray-Dual" lamp for street lighting. The illustration shows a part of the installation and by its side is one of the new lamps which combines a discharge tube with a tungsten filament, eliminating the choke and condenser

The report says that comparatively little telephone equipment of United Kingdom origin has been sold in Canada in recent years; Canadian manufacturers claim to be able to supply the entire requirements. There are prospects, however, for the sale of United Kingdom equipment in Western Canada from time to time.

For its operations during the fiscal year ended March 31st last the Canadian Radio Broadcasting Commission was voted $1,225,000 by Parliament. A new broadcasting station was erected at Quebec during the year, and another new station was added early this year at Windsor, Ontario, giving the Commission seven stations under its own direct control and operation. These are situated at Chicinotimi, Quebec City, Montreal, Ottawa, Toronto, Windsor, and Vancouver. The Government has allotted the Commission $1,500,000 in the financial estimates for the current year.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Employment in September

Employment in the engineering industry in September continued moderate on the whole, states the *Ministry of Labour Gazette*. Compared with August there was an improvement in all sections of the industry with the exception of general engineering where there was a slight decline, and it was fairly good in electrical engineering. The number of unemployed in the engineering industry fell by 648 to 110,548. In the electrical engineering section the number of unemployed was 5,534, or 6.1 per cent., as against 6.3 per cent. in the previous month and 6.9 per cent. a year ago. The unemployed in the electrical wiring and contracting industry totalled 5,071, the percentage falling from 16.7 to 15.2 (14.8 per cent. in September, 1934). In the electric cable, apparatus, lamps, &c., group, the number of unemployed was 9,004, the percentage being 6.8, against 7.1 per cent. in the previous month and 7 per cent. in September, 1934.

Derby Cables Extends Works

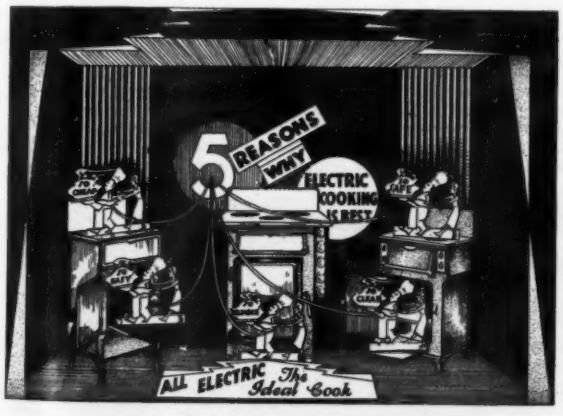
Following a steady increase in business Derby Cables, Ltd., is now building an additional bay for the manufacture of paper-insulated cables and a new suite of offices at its Derby Works. In the near future the company is also undertaking an extension of the wire-drawing and stranding department and a further extension to the rubber bay.

The Annual "Exide" Luncheon

At the Clarendon Restaurant on Thursday last week the Chloride Electrical Storage Co., Ltd., held its annual "Exide" Motor Show luncheon. As usual, Mr. D. P. Dunne, managing director, presided and entertained the company of about 250 with one of his wise and witty discourses. He claimed that the leading battery makers had practically eliminated unfair competition by combining together to provide the best products and efficient service at a reasonable price. Their success clearly showed that the manufacturer should not consider merely his own immediate interests but those of the whole industry of which he formed a part. Mr. David Bell, managing director of Trader Publications, Ltd., thanked the Chloride Co. on behalf of the motor Press, and Mr. Frank Murphy (Murphy Radio) and Mr. R. T. Lewis also spoke.

The E.D.A. November Programme

Special attention is drawn in the November Sales and Publicity Programme of the British Electrical Development Association to the two E.D.A. calendars for 1936, "A Series of Dogs" and "The Wizard in the Wall," on both of which



The E.D.A. cooker window display

space is provided for overprinting. The accompanying illustration shows the suggested window display for the month. As will be seen this introduces five selling points; the cut-out figures are obtainable from the Association. Four new designs have been added to the Association's series of bookmarkers, and illustrations of these, together with a price list, are given in the programme.

Denmark's Electrical Trade

Statistics regarding Denmark's imports and exports of electrical material during the first two thirds of this year, as compared with the corresponding period of 1934, are now available. Total imports amount to 1,435 tons, or 11 per cent. less than last year when the figure was 1,610 tons. Exports, on the other hand, show a very considerable increase, *viz.*, from 871 tons to 1,395 tons, an advance of 60 per cent. Details of imports and exports are as follows, corresponding figures for the preceding year are given in parentheses:—

Imports.—Dynamos and motors, 320 tons (459 tons); installation materials, 184 tons (188); dry batteries and accumulators, 124 tons (189); accumulator plates, 250 tons (150); other electrical apparatus, 214 tons (176); cables, 44 tons (55); conductor wire, 299 tons (393). Exports.—Dynamos and motors, 572 tons (678); refrigerators, 703 tons (398); and installation articles, 120 tons (95 tons).

"Those Were the Days . . ."

The home discomforts of "Horace" and "Belinda" form the subject of a series of eight Press advertisements which the County of London Electric Supply Co., Ltd., has prepared. These are entitled "Those were the days . . . but were they?" and depict the trials of a Victorian household in carrying out domestic duties, showing how they are dispelled in the modern household by the service of electricity. The series deals with spring cleaning, wash-day, lighting, ironing, water heating, refrigeration, electric fires, and cooking. The advertisement dealing with the last subject is reproduced herewith.

New "Clesco" press publicity

American Domestic Appliance Exports

So far this year there has been a distinct improvement in the overseas demand for American domestic electrical appliances. The appended table shows the exports of such goods from the United States during the six months ended with June last as compared with the corresponding half of 1934, from which it will be seen there was an increase of £244,099, or over 27 per cent.

	January–June. 1934.		January–June. 1935.	
	No.	Value £.	No.	Value £.
Fans	45,340	45,333	39,158	40,504
Household refrigerators	44 971	718,661	58,438	919,065
Washing machines	2,320	24,366	4,862	46,829
Irons	20,606	9,582	56,039	16,752
Cooking ranges	1,177	17,653	1,485	21,250
Other cooking and heating devices	51,140	25,917	67,830	35,616
Vacuum cleaners	6,300	22,821	7,324	22,190
Other domestic electric appliances	9,188	31,893	13,372	38,119
Totals		£896,226		£1,140,325

Italian Radio Production

It is reported from Rome that there are 110 concerns engaged in the production of radio apparatus in Italy. The capital invested amounts to 175 million lire and the value of the annual production is estimated at 120 million lire, of which 100 millions apply to receiving sets and the balance to scientific apparatus and loudspeakers.

Brussels Exhibition Awards

Messrs. R. A. Lister & Co., Ltd., have received official notification from the organisers of the International Exhibition at Brussels that they have been awarded two diplomas of honour by the International Jury of Awards for their lighting and power plant, which, as well as being an exhibit, was installed by the Exhibition authorities to provide emergency lighting in the exhibition should the main electricity supply fail. One award was made in the internal-combustion engine class and the other in the electromechanical class.

The Chloride Electrical Storage Co., Ltd., has also been awarded a diploma of honour for its exhibit.

More German Lamp Works

Elektrotechnische Zeitschrift reports that the Osram Gesellschaft has recently acquired one of the works of the Bergmann Electricitätswerke Co. in North Berlin with the object of adapting it for the manufacture of electric lamps.

India's Import Trade

A Department of Overseas Trade survey of the import trade of India for the period April 1st-June 30th, 1935, shows that electrical machinery imports increased from Rs. 37 lakhs to

Rs. 51¼ lakhs, as compared with the corresponding quarter of last year. There was also a small expansion in the purchases of electrical apparatus, including telegraph and telephone equipment, from Rs. 68.1 lakhs to Rs. 70.6 lakhs, over a half of the trade being with the United Kingdom.

Solder

The International Tin Research and Development Council has issued "Solder Bulletin No. 2," in which new applications of solder, together with many established uses and methods of application, are described. Compositions and physical properties of solders of representative grades are discussed, and the reasons for the suitability of each kind for special purposes is shown. The importance of using the right type of flux is explained, and practical details of the fluxing and tinning of a large number of metals and alloys are given. A useful feature is an account of the ordinary commercial forms in which solder is obtainable and the uses for which they are best suited. There is a list of books, research papers, and reviews dealing with the constitution, physical properties, corrosion and specifications of solders, as well as many references to the process of soldering.

The Blackburn Branch of the E.C.A.

Messrs. J. H. Walton, H. Baron, A. Duckworth, W. T. Sheldon, W. G. Senior, F. V. Fairhurst, T. Speak, D. Hull, R. Marr, W. A. McCall, F. Graham, J. Marsden, J. Slater, E. Whalley, F. L. Yates, G. H. Officer (Treasurer), T. Blackshaw (Vice-chairman), J. Walsh (Chairman), J. Heys (Hon. Secretary), A. Marr and F. F. Riding.

Cyanide Ore-treatment Plant

The process of extracting precious metals from gold- and silver-bearing ores by dissolving them in a cyanide solution is only one in a sequence of operations. Ore-treatment plant has been made and exported to all parts of the world by the Fraser & Chalmers Engineering Works (G.E.C.), whose latest publication (No. F. and C. 7385) describes cyaniding equipment very lucidly. The illustrations include plant layout drawings.

The West Hartlepool Showrooms

In our September 27th issue we described the new showrooms of the West Hartlepool Corporation Electricity Department. We now reproduce two views sent us by Mr. S. Tillotson, the borough electrical engineer, showing displays of artificial sunlight apparatus, vacuum cleaners, and an electric log-fire.

A Lighting and Installation Convention

With reference to the illustration which appeared in our last issue with the notice of the Simplex Lighting and Installation Convention at Coventry, the left-hand picture shows Mr. J. J. H. Hunt, A.I.E.E., giving a talk on modern wiring practice, and not Mr. J. Huntington, the joint general manager, as we incorrectly stated.

Showrooms for South Chingford

Yet another Northmet showroom has been opened. It is at Hall Lane, South Chingford, where facilities are provided for cooking and other demonstrations in an attractive lecture hall on the first floor.

Blackburn Electrical Contractors

The accompanying illustration shows the members of the Blackburn Branch of the Electrical Contractors' Association who collaborated with the Blackburn Corporation Electricity Department in organising the recent electrical exhibition. In sending us the photograph, Mr. J. Heys, the hon. secretary of the branch, states that all concerned were satisfied with the attendance, and it is confidently expected that the local electrical traders and the Electricity Department will benefit considerably as a result of the effort.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the October 1st cost-of-living figure (45 per cent. above the 1914 level) will not involve any alterations in wages on the third pay-day in November.

Mersey Cable Works Extension

The premises of the Mersey Cable Works, Ltd., Linacre Lane, Bootle, which were only recently extended, are to be further enlarged. Contracts have been placed for the erection of two new buildings which will enable the factory to cope easily with present requirements, and at the same time will make provision for the probable continuance of increased demand. One building will be used for an extension of the rubber manufacturing department, and will use machinery now under construction. The other building will be a new packing and dispatching department, able to handle 50 per cent. more business than at present. The space which this new department will release will be used for manufacturing purposes and will relieve congestion in other directions.

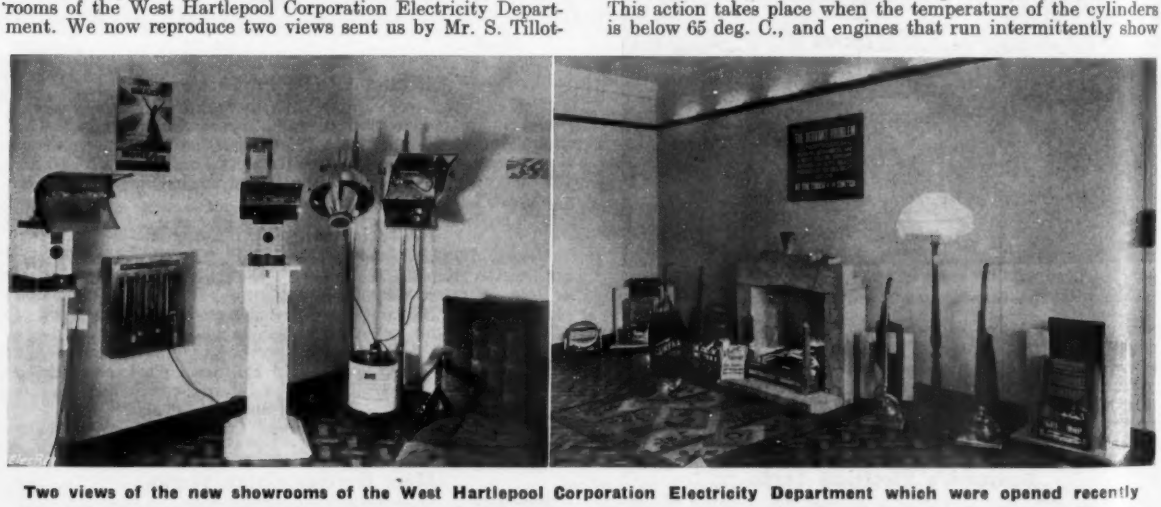
Trade Announcements

As from October 28th, Messrs. Young & Wildsmith, electrical and radio distributors, are opening a new branch at 49a, York Road, Ilford (telephone: Ilford 2691), where stocks of a variety of electrical and radio products will be held.

Mr. P. J. Ambrose has purchased the electrical business at High Street, Heathfield, Sussex, formerly owned by Ryder & Co., Ltd., from Caffyns, Ltd.

Engine Cylinder Wear

Researches undertaken by the Institute of Automobile Engineers indicate that the chief cause of cylinder wear in Diesel and other oil engines is chemical action between the metal and the carbonic acid and moisture produced by combustion. This action takes place when the temperature of the cylinders is below 65 deg. C., and engines that run intermittently show much greater wear than those that run continuously. Chemical means of neutralising the acids or inhibiting their action on the cylinder will have been devised. Messrs. Alexander Duckham & Co., Ltd., report that tests carried out with their "Commadcol" lubricating oil show that its use has reduced by as much as 30 per cent. the cylinder and piston-ring wear due to the corrosive action of the gases during



Two views of the new showrooms of the West Hartlepool Corporation Electricity Department which were opened recently

warming up periods. For producing a corrosion-resisting surface on the cylinder and piston rings of petrol engines, such as those used for small private lighting plants, the company has introduced "Wear-Cure" tablets which are most efficacious when introduced into the fuel tank during the running-in process.

"Signs of the Times"

The accompanying illustration is reproduced from a photograph sent us by Mr. T. A. G. Margary, electrical engineer and manager of the Wolverhampton Corporation Electricity Department, and shows a recent window display at the Department's showrooms. As will be seen, models of modern road

A novel display by the Wolverhampton Corporation Electricity Department

traffic signs have been utilised to make an effective display and to draw attention to the modern way of cooking by employing electricity.

New Municipal Showrooms

The present electricity showroom of the Rotherham Corporation being inadequate for present requirements, the Electricity Committee is recommending the Council to lease new premises at the corner of Westgate and Ship Hill. The cost of fittings for the new showroom will be between £750 and £1,000.

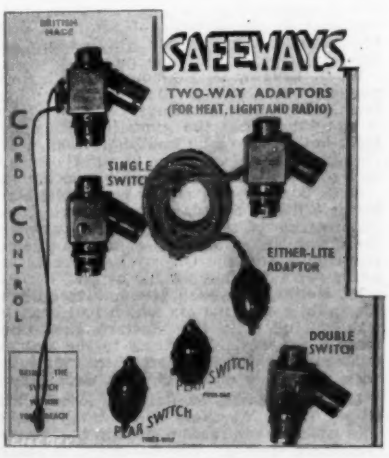
The new showrooms and offices of the Lichfield Corporation Electricity Department were formally inaugurated on October 16th by the Mayor, Councillor T. Moseley. The premises are situated at the junction of Market Street and Dam Street with two frontages. On the ground floor is the main showroom in which is displayed a full range of all types of electrical apparatus, while the first and second floors contain offices for the city electrical engineer (Mr. W. F. Russell) and his staff. The main stores are in Backcester Lane.

A Co-partnership Scheme

The annual meeting of the co-partnership scheme and hospital and benevolent fund of the Mid-Southern Utility Co. was held on October 16th, when Mr. R. W. Edwards (chairman and managing director) said that the report and accounts showed record figures for the year ended June 30th, particularly so with regard to the savings fund. Members had put by £3,318, and the total passed through this account since the scheme began was £25,664.

A Display Board

Messrs. Philip Knowles, Ltd., 9-10, Domingo Street, E.C.1, have sent us an attractive display board fitted with "Safeway" adaptors and switches which is admirably suited for either the counter or as a window display. The improved types of adaptors displayed include cord control, two-way, double switch, and "Eitherlite," and push-bar and three-way pear switches.



The new display board

Orders Recently Booked

The Portsmouth Corporation has placed an order with the Associated Equipment Co., Ltd., for seventy-six trolley bus chassis. These will be of the A.E.C.-English Electric "661T," four-wheel type, and like those for service with the London Passenger Transport Board, will embody a number of improved features.

The British Thomson-Houston Co., Ltd., has secured orders for the supply and erection of 267 "Diron" lanterns, control boxes and "Mercra" lamps (second order) from Leyton Borough Council, and for twenty-three "Circra" lanterns, control gear, standards and "Mercra" lamps from the Corporation of London for the Metropolitan Cattle Market.

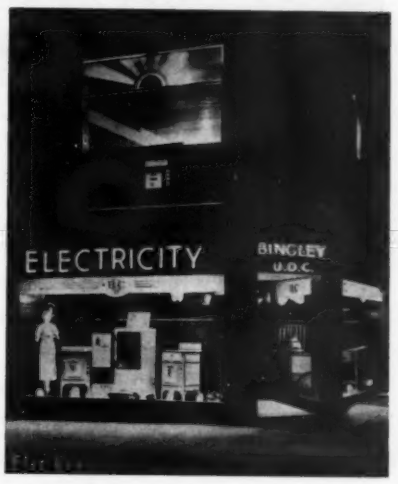
Contractors' Year Books

The 1935-36 Year Book of the Electrical Contractors' Association (5s.), which has now been published, is a very useful work of reference. In addition to lists of members (alphabetical and geographical), wages agreements and working rules, there are particulars of supply undertakings, a list of British Standard Specifications and other serviceable information.

The 1935 edition of the Year Book and Diary of the Electrical Contractors' Association of Scotland has just come to hand. In addition to containing particulars of the activities of the Association and a directory of members of other electrical trade associations, it includes a great deal of information of interest to the electrical contractor. The price is 3s. (3s. 6d. post free).

The Bingley Showrooms

The Bingley Urban District Council has recently modernised its electricity offices and showrooms at a cost of £600. The premises are situated in the centre of the main street, and, in addition to a Travertine marble frontage, neon signs have been placed on the facia in blue and gold "Cleora." The large window over the showrooms is the general office and also affords additional window-space. The scheme has been carried out under the supervision of the Council's electrical engineer, Mr. O. G. Cook, by Messrs. Drake & Warters, of Wakefield. The reconstructed frontage is shown in the photograph which is produced herewith.



The showrooms of the Bingley U.D.C. which have recently been modernised

For Sale

The Farnham Gas and Electricity Co. has transformers for sale.

Winchester Electricity Corporation Department has for disposal a 1,250-kW turbo-generator.

(See our classified advertisements.)

New E.C.A. Members

At a recent meeting of the E.C.A. Council a number of applications for membership were considered, and the following contractors were admitted to full membership:—

A. Meckhonik, 854, Old Kent Road, S.E.15.
R. Sawford, 32, Station Road, N.W.4.
S. C. Pygall (Sellcon Electrical Co.), 28, Green Street, Bethnal Green, E.2.
C. C. E. Champion (E. & C. Champion), Sutton, Surrey.
J. W. Howe (Duncan Mays), 28-30, Doyle Gardens, N.W.10.
A. E. Hayward (A. E. Hayward & Son), Bath.
G. R. Ennor, Falmouth
A. C. Farrow, Nottingham.
N. Tizzard, Ilkeston.
A. Quain, Sowerby Bridge.
J. W. Storr (Storr & Co.), Hull.
B. L. Oliver, Birtley, Co. Durham.
G. E. Taylor (G. E. Taylor, Ltd.), Littleborough.
B. Howard, Stockport.

The following contractors were admitted to associate membership:—

E. Woolley, Brentwood, Essex.
R. B. Johnson, Gloucester.
John Bell, Sleaford.
Frank High, Blackpool.
H. F. Russon (Russon's), Stretford.
F. R. Little, Ashington.

Winding-up Petition

In the Companies' Court on Monday Mr. Justice Bennett again had before him the petition for the compulsory winding-up of Edison Bell (International), Ltd. Mr. Gough, who appeared for Mr. H. Hesford, a creditor for £1,700, and another

creditor for £700, asked for an adjournment on the ground that negotiations were pending for the sale of the company's interests in Yugo-Slavia. It was felt that if there were a winding-up order here it would prejudice the interests of the company. His Lordship adjourned the hearing of the petition for three weeks.

A Lincoln Carnival Tableau

In connection with the recent celebrations held during the Centenary of Local Government, the Lincoln Corporation Electricity Department entered a decorated vehicle in the local carnival procession. As our picture shows, this was based on

Tableau by the Lincoln Corporation Electricity Department

one of the E.D.A. national advertisements, and was designed to emphasise that electricity is best for cooking. During the celebrations the Department also floodlighted the central tower of Lincoln Cathedral.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, October 23rd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£200	£3 inc.
Grade II ... ... ,,	£144	£2 inc.
Grade III ... ... ,,	£75	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	7¾d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 10d.	— ¶
c ,, Wire, basis ... ... ,,	7¾d.	¼d. dec.
c Copper Tubes (solid-drawn) ... ,,	10¼d.	—
g ,, Bars (best selected)... ... per ton	£68	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£39 15s.	£1 10s. dec.
d ,, ,, Wire Rods ... ,,	£44 15s.	£1 dec.
d ,, ,, H.C. Wire ... per lb.	7⅞d.	¼d. dec.
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	5¼d.	¼d. inc.
i Iron, Pig. (Cleveland No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£19 10s.	£1 10s. dec.
g Mercury ... ... per bot.	£11/10 to £12	5/- inc.
e Mica (in original cases) small ... per lb.	6d. to 1/-	—
e ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11¾d.	—
p ,, ,, rolled strip & sheet ,,	11¼d.	—
p ,, ,, wire ... ... ,,	1/0½	¼d. dec.
o Platinum ... ... per oz.	£7 17s. 6d.	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	¼d. dec.
g Spelter ... ... per ton	£16	17/6 dec.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£223	£5 5s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Catalogues and Lists

A.E.W., Ltd., Imperial Works, High Street, Edgware.—A leaflet on a small domestic circuit-breaker, giving reduced prices.

Gent & Co., Ltd., Faraday Works, Leicester.—A catalogue section dealing with "Tangent" electro-motor syrens.

Imperial Lighting Co., 2, 4 and 6, Pocock Street, Blackfriars Road, London.—A leaflet on "Fairyland strip for Christmas illuminations."

Superlamp, Ltd., 6, Paul Street, Finsbury Square, E.C.2.—Electric lighting fittings are dealt with in a new 48-page catalogue.

M.K. Electric, Ltd., Wakefield Street, Edmonton, N.18.—A new edition (120 pp.) of the company's catalogue of sockets, plugs, switches and cooker control units.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.—A broadsheet on a new battery receiver, No. 822B.

Veritys, Ltd., Aston, Birmingham.—Leaflets giving particulars of the "Verity" wash-boiler and "Maxlume" reflectors.

Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.17.—A retailers' reference catalogue of "Ever-Ready" products.

E. R. Morton, Ltd., 11, Newman Street, Oxford Street, W.1.—A leaflet on the "Dim-a-lite" attachment which is now available again.

Falk, Stadelmann & Co., Ltd., 83, Farringdon Road, E.C.1.—A new catalogue of table and floor standards and shades.

Tecalemit, Ltd., Great West Road, Brentford.—A complete catalogue of lubricating and special equipment for car engines and chassis.

Pyrene Co., Ltd., Great West Road, Brentford.—Details of the "Pylumin" process for the protection of aluminium.

Straight-Lite Reflectors, Ltd., 73, Canonbury Road, N.1.—A new catalogue of modern architectural lighting fittings.

British Technical Cork Products, Ltd., Liverpool Road, Slough.—A booklet on "Zecor" agglomerated cork products.

Cochranes (Middlesbro') Foundry, Ltd., Middlesbrough.—Stock list of cast and spun iron pipes.

F. Thomas & Co., Ltd., 189, Drummond Street, Hampstead Road, N.W.1.—Two illustrated catalogues relating to "Efteelite" modern lighting fittings and unit fittings for commercial, industrial and hospital lighting.

Bankruptcy Proceedings

S. W. Godfrey, 44, Cromwell Road, Sprowston, Norfolk, lately 141, Mansfield Road and 289, Alfred Street Central, both Nottingham, electrical and radio engineer.—At the first meeting of the creditors held on October 16th at the Official Receiver's office, 22, Regent Street, Park Row, Nottingham, the statement of affairs showed gross liabilities of £1,068, of which £303 was expected to rank for dividend, and there was a deficiency of £675. Debtor attributed his failure to lack of capital, over-buying on credit terms, excessive allowances to customers upon sets taken in part exchange, losses through free servicing of sets, and heavy expenses in relation to the turnover. The matter was left in the hands of the Official Receiver.

G. F. Kennedy, trading as Kennedy & Co., Market Square, Shepton Mallet, Somerset, electrical engineer.—This debtor attended at the Guildhall, Wells, recently for his public examination. He attributed his failure to business inexperience, local trade depression and keen competition. His statement of affairs showed liabilities of £763 with estimated assets of £132, or a deficiency of £631. The examination was closed subject to the signing of the notes.

E. C. Sparkes, electrical manufacturers' agent, 118, Wardour Street, W., and Parchmore Road, Thornton Heath.—An application was made on October 15th to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge. Mr. C. Bruce Park, Official Receiver, reported that the applicant failed in October, 1918, with ranking liabilities of £351 and no available assets. He began business in 1906 with £200 capital and traded in partnership until 1913, but subsequently alone until the failure. The outbreak of war in 1914 stopped his agency business and he subsequently traded as a principal for the sale of electrical goods. The delay in applying for a discharge was due to the absence of funds to defray the cost of the application. His Honour granted a discharge subject to a further suspension of one month.

W. C. Bryant, 13, Rodbourne Road, Swindon, electrical and wireless engineer.—At the public examination herein held at the County Court Buildings, Clarence Street, Swindon, recently, it was stated that the gross liabilities had been estimated at £191, but debtor admitted there was a further claim for £4. He attributed his failure to want of capital, bad debts, and lack of trade. The examination was concluded.

S. D. C. Orchard (trading as Empire Radio), 43, Malmesbury Road, Shirley, Southampton, electrical engineer.—The public examination of this debtor was to have been held recently at the Court House, Castle Square, Southampton, but debtor did not attend, and the Official Receiver intimated that he would apply for a warrant for his arrest.

W. Hodge, 3, Saltash Street, Plymouth, electrical engineer.—The public examination which had been previously adjourned, was concluded at the Western Law Courts, Guildhall, Plymouth, recently. According to the statement of affairs which debtor had returned there were ranking liabilities of £1,607, with net assets of £1,213, or a deficiency of £394.

H. C. Bridgman, 37, Canynge Road, Clifton, Bristol, lately 7, Abbey Road, Westbury-on-Trym, Bristol, electrical engineer.—The public examination herein was continued recently at the Guildhall, Bristol. The statement of affairs lodged showed liabilities of £931, with assets of £33, and a deficiency of £898. Debtor said that during the adjournment period he had produced three pass books. He attributed his failure to insufficient net profits to cover living expenses and repayment to the bank and mortgagees. The examination was closed.

R. L. D. Mathews, 24, Kingsway Road, Burnham-on-Sea, Somerset, wireless and electrical engineer.—The first meeting of creditors herein was held on October 14th at the Official Receiver's Office, 26, Baldwin Street, Bristol. Debtor said that

after trading in partnership with his father he commenced business on his own account in September, 1933, at High Street, Burnham. He transferred the business to Regent Street in March, 1934. He attributed his present position to want of capital, competition and bad debts. His statement of affairs showed liabilities of £230 with assets of £79. The matter was left in the hands of the Official Receiver as trustee.

G. Wiseman, radio dealer, 317 and 322, Walworth Road, Walworth, S.E.—Application for discharge to be heard on November 5th at Bankruptcy Buildings, Carey Street, W.C.

D. C. Luen, wireless dealer, 78, High Street, Barry.—Application for discharge to be heard on November 5th at the Law Courts, Cathays Park, Cardiff.

H. Fraser and **R. J. Ardern** (Ardern & Fraser), electrical appliances dealers, 29, Church Street, Accrington.—Trustee, Mr. J. Longthorn, 28, Queen Street, Great Harwood, released August 27th.

J. H. Dinham and **J. H. Meredith** (the Electra Contracting Co.), electrical contractors, 50, New Zealand Road, Cardiff.—Last day for receiving proofs for dividend October 29th. Trustee, Mr. L. S. Findlay, 35, Windsor Place, Cardiff.

G. A. Goldsbrough (deceased), lately trading as G. A. Goldsbrough & Co., 24, Aldermanbury, Bradford.—First and final dividend of 1s. 2½d. in the £, payable October 22nd at 71, Manningham Lane, Bradford.

S. G. Penrith, electrical contractor, 50, Mount Pleasant, Barrow-in-Furness.—Receiving order made October 15th on debtor's own petition. First meeting October 29th at 16, Cornwallis Street, Barrow-in-Furness. Public examination November 15th at the Magistrates' Court, Barrow-in-Furness.

F. W. Smart (Edgbaston Electrical Co.), electrical contractor, 212, Edward Road, Cannon Hill, Birmingham.—Trustee, Mr. C. Hoult, 159, Great Charles Street, Birmingham, Official Receiver, released October 3rd.

W. M. Hudson, electrical contractor, 64, Salisbury Avenue, North Shields.—Trustee, Mr. P. J. McLellan, 81, St. Mary's Place, Newcastle-upon-Tyne, Official Receiver, released October 3rd.

J. C. A. Willey, wireless engineer, 12, Fernhill Road, and 47 and 49, Cowley Road, Oxford.—Trustee, Mr. J. B. Simmons, 8, Forbury, Reading, Official Receiver, released September 26th.

D. Boulton and **L. C. Turner,** wireless and electrical engineers, lately trading at Old Town Avenue, Plymouth.—Trustee, Mr. J. W. Ching, Princess Chambers, Sussex Terrace, Plymouth, released September 7th.

A. D. M. Mayer, electrical engineer and wireless specialist, 75, Pasture Road, Goole.—Last day for receiving proofs for dividend November 6th. Trustee, Mr. F. E. Bendall, 27, York Street, Sheffield.

C. E. Keates, electrical and mechanical engineer, 110, Brent Street, Hendon, N.W.—Application for discharge to be heard on November 14th at Bankruptcy Buildings, London, W.C.2.

F. S. S. Wates, wireless set manufacturer, 53, Lancaster Gate, W.2.—Application for discharge to be heard on November 12th at Bankruptcy Buildings, Carey Street, W.C.

E. Howitt (Howard & Co.), wireless dealer, 368, South Road, Walkley, Sheffield.—First and final dividend of 1s. 7¼d. in the £, payable October 22nd at 14, Figtree Lane, Sheffield.

Private Arrangements

H. G. Stedman, trading as H. G. Stedman & Co., 167, Edmund Street, Birmingham, neon sign manufacturer.—A meeting of creditors was held recently, when the statement of affairs showed ranking liabilities of £2,237, of which £651 was due to the trade. There was also a partly secured creditor for £2,085, who held security valued at £300, leaving £1,185 to rank as unsecured. After allowing £90 for preferential claims the net assets were £291—a deficiency of £1,945. Debtor attributed his position to carrying on business on too large a scale. His father, who was the partly secured creditor, intimated his willingness to withdraw his claim. It was resolved that a deed of assignment should be executed to Mr. F. E. Bendall, of Messrs. Poppleton & Appleby, of Birmingham, as trustee.

C. Hughes, electrician, 2, West Street, Ewell, Surrey.—A meeting of creditors was held recently, when Mr. W. A. J. Osborne submitted a statement of affairs which showed liabilities of £612, of which £281 was due to the trade and £332 to cash creditors. After allowing £69 for preferential claims the net assets were £3, or a deficiency of £609. The business was commenced in January, 1932, when the debtor had a free capital of about £40. He borrowed £160 from relatives and had from time to time obtained further cash advances. It was resolved to accept a cash composition of 2s. 6d. in the £.

Company Liquidations

Kubex, Ltd.—Winding up voluntarily. Liquidator, Mr. C. Thornton, 22, Lune Street, Preston.

John Lewis, Wireless, Ltd.—Winding up voluntarily. Liquidator, Mr. F. A. Perigo, 5, York Buildings, Esplanade, Weymouth.

Looe Electricity Co., Ltd.—Meeting November 14th at Thames House, Millbank, S.W., to receive an account of the winding-up by the liquidator, Mr. H. Fraser.

J. Wakefield & Sons, Ltd.—Winding up voluntarily. Liquidator, Mr. N. A. Tye, 109, Colmore Row, Birmingham.

Dissolution of Partnership

E. Beal & Sons, electrical engineers and retailers of electrical and wireless goods, 54, Church Street, Eccles.—Messrs. Ebenezer, Edgar and Lionel Beal have dissolved partnership. Mr. L. Beal will attend to debts and carry on the business.

Government Contracts

THE following contracts were placed by various Government Departments during September:—

ADMIRALTY.

Terminal blocks.—Plessey Co.

Boxes, switches, &c.—Engineering & Lighting Equipment Co.; Wm. McGeoch & Co.; Whipp & Bourne.

Electrical installation.—G. E. Taylor & Co.

Motor generators.—Mawdsleys; Laurence, Scott & Electromotors.

Searchlight lamps and signalling projectors.—Clarke, Chapman & Co.

Switchgear, &c.—B.T.H.; A. Reyrolle & Co. Sub-contractors: English Electric Co.; Siemens Bros.; Berry Wiggins & Co.; G.E.C.; Met-Vick Elecl. Co.; Batteries, Ltd.

Wireless switches.—Gambrells Rowse & Snoaden; Marconi's; H. W. Sullivan.

W.t. valves.—Mullard Radio Valve Co.; G.E.C. Sub-contractors; Thermal Syndicate; H. W. Sullivan; T. J. Grainger & Co.; Prestware; Ediswan.

WAR OFFICE.

Electric cable.—Siemens Bros.; Standard Telephones.

Generators.—Electro-Dynamic Construction Co.; Electric Construction Co.; Ruston & Hornsby; R. A. Lister & Co.

Transformers.—Electric Construction Co.

Turbo-alternator.—English Electric Co.

W.t. valves.—Ediswan.

AIR MINISTRY.

Accumulators.—Peto & Radford; Chloride Elecl. Storage Co.; Oldham & Son; Batteries, Ltd.

Underground cables.—Malcolm & Allan (London).

Convertor, &c.—Bruce Peebles & Co.

Lamps.—Utility Electric Co.; Johnson & Phillips.

Mercury-arc rectifiers.—Elecl. Equipment & Carbon Co.

Test meters.—Automatic Coil Winder & Equipment Co.

Transmitters.—Marconi's.

W.t. valves.—Ediswan; G.E.C.; A. C. Cossor.

X-ray apparatus.—Schall & Son.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; Ediswan; Ericsson Telephones; G.E.C.; Hall Telephone Accessories (1928); Phœnix Telephone & Electric Works; Plessey Co.; Siemens Bros.; Standard Telephones; Telephone Mfg. Co.

Telegraphic apparatus.—Creed & Co.

Testing and protective apparatus.—Met.-Vick. Elecl. Co.; Standard Telephones.

Distributing boards.—Revo Electric Co.

Cable.—B.I. Cables; Connollys (Blackley); G.E.C.

Compound.—Dussek Bros. & Co.

Telephone cords.—London Electric Wire Co. & Smiths; Reliance Elecl. Wire Co.; Siemens Bros.; Standard Telephones.

Electric lighting fittings.—Electrical Conduits.

Lamps.—J. H. Naylor; Ediswan; G.E.C.

Transformers.—G.E.C.

Wire.—Enfield Cable Works; Concordia Electric Wire Co.; L.P.S. Electrical Co.; Macintosh Cable Co.

Cabling.—Westerham-Sevenoaks: United Telephone Cables. Newmarket-Ipswich: Siemens Bros.

Cabling and loading coils.—Slough-Ascot: Standard Telephones. Chatham-Maidstone, Bolton-Blackburn, and Leicester-Kettering: United Telephone Cables. Sub-contractor for Leicester-Kettering: Automatic Electric Co. for loading coils. Guildford-Aldershot-Farnham-Alton, and Yeovil-Marston Magna: Pirelli-General Cable Works. Sub-contractor for Yeovil-Marston Magna: Salford Elecl. Instruments for loading coils.

Cabling, loading coils and terminations.—Northampton-Bedford-Cambridge: Siemens Bros.

Cabling—additional loading.—Carlisle-Newcastle-upon-Tyne: Siemens Bros. London-Ashford-St. Margaret's Bay: Standard Telephones.

Telephone exchange equipment.—Newport (I. of W.); Wednesbury; Pinner; London trunk exchange; Nottingham trunk exchange: Standard Telephones. Sub-contractors for Wednesbury: D. P. Battery Co. for batteries. Electric Construction Co. for motor generator. Market Harborough; Radcliffe (Manchester); Streetly (Walsall): Ericsson Telephones. Sub-contractors for Market Harborough: D. P. Battery Co. for batteries; Electric Construction Co. for motor generators. Sub-contractors for Radcliffe: Pritchett & Gold & E.P.S. Co. for batteries: Electric Construction Co. for motor generator. Mountview (London); Roundhay, Headingley, Chapeltown (Leeds); Torquay; Holborn Tandem; Avenue (London); Farnham; Rusholme; Telephone House (Manchester): Automatic Electric Co. Sub-contractors: Alton Battery Co. (batteries); Electric Construction Co. (motor generators and ringing machines). Edinburgh (Central); Chichester; Dysart (Kirkcaldy); Leighton Buzzard: Siemens Bros. Sub-contractors for Chichester: Chloride Elecl. Storage Co. for batteries; Electric Construction Co. for motor generators. Highbury (Birmingham); Manchester Central; Newcastle-under-Lyme (Hanley); Glasgow trunk exchange: G.E.C.

Telephonic repeater equipment.—Birmingham: G.E.C. Cambridge: Newton Bros. (Derby). Sub-contractors for Cambridge: Victor Oil Engine Co. for oil engine. D. P. Batteries for batteries. Hull; Manchester: Standard Telephones.

Voice-frequency telegraph equipment.—Plymouth; Central Telegraph Office (London): Standard Telephones.

H.M. OFFICE OF WORKS.

Electric wiring for lighting and power, National Maritime Museum, Greenwich: Read & Partners.

Electrical accessories.—J. H. Tucker & Co.

CROWN AGENTS FOR THE COLONIES.

Automatic exchange extension.—G.E.C.

Cable.—B. I. Cables; Callender's; Macintosh Cable Co.; Siemens Bros.

Oil-engine driven electric generating plant.—Ruston & Hornsby; English Electric Co.

Electrical fittings for caboose coaches and train lighting and headlight spares.—J. Stone & Co.

Portable electric drills.—Consolidated Pneumatic Tool Co.

Village broadcast receivers and batteries.—Marconiphone Co.

Wireless apparatus.—Marconi's.

Electricity Supply

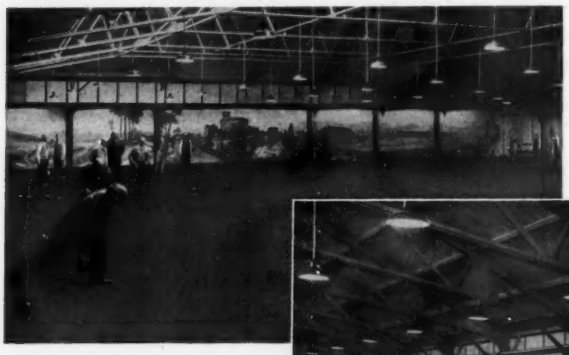
Lighting, Domestic, Power

Aldenham.—CHEAPER ELECTRICITY.—Watford Town Council has reduced the tariffs in force at Aldenham from 10 per cent. to 5 per cent. in excess of those prevailing within the borough.

Ashford (Kent).—EXTENDED HIRE-PURCHASE FACILITIES.—Refrigerators and electric sterilisers are to be supplied by the Urban District Council on hire-purchase terms.

Ayrshire.—A FAVOURABLE REPORT.—The report of the engineer and general manager of the Ayrshire Electricity Board, Mr. W. C. Bexon, for the year ended May 5th, 1935, shows that 15.4 per cent. more electricity was sold than in the previous year (63,812,567 kWh, compared with 55,259,079 kWh). Revenue amounted to £318,489, an improvement of £16,829, and there was a £12,144 rise in working expenses to £191,073, the net profit (£6,235) being slightly less than in 1933-34. The number of consumers at the end of the year under review was 3,973, an increase of 514, while the kW load rose by 10,647 to 106,860 kW. The maximum demand on the Kilmarnock station fell from 19,150 to 16,600 kW, while that of Saltcoats rose from 1,680 to 5,865 kW, due largely to a redistribution of the load.

Belgian Congo.—EXPORT OF ELECTRICITY.—Arrangements have recently been completed under which the Sanga hydro-



electric station, which supplies power to Leopoldville, will also export power to Brazzaville in the neighbouring French colony. The power will be transmitted by a 6,000-V submarine cable, which will convey it across the River Congo and Stanley Pool.

Berwickshire.—ELECTRICITY AT A QUARRY.—Electricity has been installed at the County Council's Borthwick quarry.

Two views of the new indoor bowling green of the Paddington Bowling and Sports Club. The hall is lighted by fifty-six 300-W G.E.C. dispersive reflectors housing "Osram" lamps

Bexhill.—BETTER LOAD FACTOR.—Mr. C. A. Frost, the borough electrical engineer, states in his annual report for the year ended March 31st last that 426 new consumers were connected, representing 1,295 kW. While the maximum demand decreased from 3,959 kW to 3,722 kW, the total sales of electricity rose from 6.13 to 6.6 million kWh (7.7 per cent. increase). Cooking, heating and power represented 70 per cent. of the sales. The amount of electricity sold per head rose from 290 to 305 kWh.

Birkenhead.—LIBRARY HEATING.—The electrical engineer is to submit a scheme for heating the Central Library by electricity.

MAINS.—At a cost of £1,142 the Electricity Committee is to extend mains in the Raby Vale area, and an underground main is to be substituted for the overhead line at Irby Village (£1,620).

Blackpool.—ELECTRICAL CONNECTIONS.—At the end of March last 33,200 premises of all types out of a total of 41,500 in Blackpool and the rural areas supplied by the Corporation were connected to the electricity mains.

Bradford.—CABLE EXTENSION.—The Electricity Committee has approved cable extensions at an estimated cost of £3,772.

Canada.—ONTARIO POWER CONTRACTS.—A *Reuter* message from Toronto states that the cancellation of certain contracts between four power companies and the Ontario Hydro-Electric Commission, which were nominally invalidated by the Ontario Legislature over six months ago, is not to be formally proclaimed as law yet. The companies are to confer with the engineers of the Hydro-Electric Commission regarding a possible concrete offer to reduce the amount of power to be purchased by Ontario. An announcement to this effect was made by the Premier, Mr. Hepburn, on October 22nd.

Colchester.—SUPPLY TO TEY.—The City Council is to give a supply to Great and Little Tey at an estimated cost of £1,307.

LOANS.—Application has been made for sanction to loans of £30,000 for mains and services; £6,000 for sub-station equipment; £9,000 for meters; £5,000 for wiring installations; and £18,000 for domestic apparatus.

Derby.—RESPONSIBILITY FOR STREET LIGHTING.—Speaking on the question of street lighting at a Town Council meeting recently, Councillor Sturgess said that a policy was decided upon in 1933, and it was now proposed that the Council's resolution should be carried into effect. It was felt that there should not be dual control with responsibility resting upon the Electricity Department and the Highways Department, but that the control should be vested in the Electricity Department. He said that at present there were approximately 4,000 street lamps in the town, of which 3,000 were electric. A complete change-over could be effected to the improvement of the present lighting arrangements of the borough. Another councillor moved the reference back of this matter on grounds of a difference of opinion regarding the respective merits of electricity and gas for street lighting, but the report was adopted.

Dewsbury.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to Chickenley at an estimated cost of £2,500.

Dorchester.—HIRE-PURCHASE SCHEME.—The Town Council has applied for a loan of £2,000 for apparatus to be sold on hire-purchase terms. Potential purchasers are to be allowed the use of a demonstration cooker or wash-boiler for trial purposes for a period not exceeding twenty-eight days before completing an agreement.

Dundee.—LIGHTING PUBLIC STAIRWAYS.—The Property Owners' and Factors' Association has proposed to the Corporation that all common stairs in the city shall be electrically lighted, for which the association is prepared to pay at the rate of 16s. per lamp. The proposal is to be considered by a sub-committee.

Ealing.—ELECTRIC COOKING TUITION.—Cooking lessons are to be given twice weekly during the winter at Electricity House.

Elham.—STREET LIGHTING.—Street lighting by electricity has been introduced, the installation being carried out by the Folkestone Electricity Supply Co., Ltd.

Eyemouth.—PLANS FOR A SUPPLY.—Details of the Scottish Southern Electric Supply Company's plans for erecting overhead lines on a new housing estate were placed before the Town Council recently, and it was stated that this was only the first development of a scheme covering all the main streets of the area. The Council approved the plan in principle, and also asked the company to submit an estimate for converting the street lighting throughout the burgh from gas to electricity.

Flaundon (Herts).—FRINGE ORDER.—The Chesham Electric Light & Power Co., Ltd., is seeking a Fringe Order to supply premises in the area.

India.—NEW TRANSMISSION LINE.—The construction of the Mysore to Bhadravati 78-kV transmission line, by which a supply will be provided to the Bhadravati ironworks, has just been completed.

Irish Free State.—DUBLIN.—The Corporation has decided to proceed with the Poulaphouca scheme of tapping the headwaters of the River Liffey for an increase of the city's water supply whether the Electricity Supply Board co-operates in a suggested hydro-electric scheme or not.

Llanidloes.—BULK SUPPLY.—The Town Council is applying for an Order to supply electricity, which it is proposed to obtain in bulk from the North Wales Power Co.

London.—ISLINGTON.—It is proposed to reduce the present charges of 3d., 2½d., 2¼d., 2d. and 1¾d. to 2¼d., 2¼d., 2¼d., 1¾d. and 1½d. per kWh respectively, and the charge for rental wiring installations from 2½d. to 2d. per kWh.

Manchester.—CENTRAL STREET-LIGHTING CONTROL.—In the annual report of the Highways Committee it is mentioned that a system of centralised control of electric lamps has been installed. This operates over the existing cable networks and enables street lighting to be switched on or off from a remote point without interference with other supplies. The report shows the total number of lamps in use to be 29,430, of which 8,100 are electric and 21,331 gas, lighting 759 miles of roads and passages. About 640 additional electric lamps were erected during the year, replacing gas lamps. Electricity used amounted to 8,514,000 kWh, representing an increase of about 500,000 kWh on the previous year.

New Zealand.—CHRISTCHURCH.—The accounts of the municipal Electricity Department show a revenue of £219,359, an increase of approximately £9,000 over the previous year,

although still below the peak years of 1930 and 1931. The working expenses were £63,252, and the balance to the allocation account £26,009. Mr. E. Hitchcock, the general manager, states in his annual report that the maximum load (16,370 kW) was 824 kW higher than in the previous year, and was the highest ever recorded. There was an increase of five million kWh in the amount of electricity sold, bringing the total to 58 million kWh. The average cost per kWh to the consumers was: Domestic, 0.83d.; commercial, 1.86d.; and industrial, 0.74d. Considerable improvements were made in the municipal street lighting, and during the year "Osira" electric-discharge lighting was introduced.

St. Nicholas Cathedral, Newcastle-upon-Tyne, where the new electric lighting installation includes Benjamin elliptical angle reflectors hidden behind the roof beams to light the chancel and parabolic angle reflectors in similar positions for illuminating the sanctuary and reredos

Northern Ireland. — LONDONDERRY.—The Corporation has accepted the proposals of the city electrical engineer (Mr. R. V. Macrory) for the installation of additional generating plant, at a cost of £25,000, to meet the Electricity Board's demands; the needs of the factories, which are busier than ever; and the increased demand for domestic purposes.

Richmond.—INQUIRY.—Colonel F. Gordon Tucker, of the Ministry of Transport, conducted an inquiry recently into an application by the North-Eastern Electric Supply Co., Ltd., for an Order granting wayleaves in connection with overhead cables and poles carrying electricity to Skeeby, Gilling, as the company had failed to arrange terms with the owners of certain properties on the route chosen. It was claimed by the owners, who are farmers, that the rentals offered were not adequate compensation for the loss of value of the land. After hearing the evidence Colonel Tucker visited the farms and later stated that he could not advise the Ministry to make the Order. He thought an amendment of the route should be considered.

Sandbach (Cheshire).—ELECTRICITY IN COUNCIL HOUSES.—The Urban District Council has granted an application for electric lighting to be installed at Council houses at Goostrey, the tenants to pay an additional 4d. per week rent to cover the cost, and to provide their own lamps and shades.

Shipley.—NEW SWITCHGEAR.—The Electricity Committee is to replace switchgear at the Wharf Street sub-station at a cost of £1,640.

Skipton (Yorks).—NEW VILLAGE SUPPLIES.—Electricity is about to be supplied to Skipton-on-Swale and Howe, while in the near future a start will be made supplying Pickhill. The supply will be obtained from a main near Sinderby, and the route will be *via* Ainderby Quernhow to Howe and Skipton. Another line will run direct from Sinderby to Pickhill. At Howe electricity is to be installed in every house, and there will be electric street lighting.

Stanhope (Co. Durham).—PETITION FOR ELECTRICITY.—Following a petition from 150 residents at Rookhope the Stanhope Parish Council has decided to obtain estimates for the supply of electricity to houses in the area. The Weardale Lead Co. is considering a scheme to install extensive electrical plant at the Rookhope mine and to take electricity to Rookhope.

Strathallan.—ELECTRICITY ON FARMS.—An extensive electrification scheme has been completed on the Strathallan and Trinity Gask estates, which includes many farms. Power is obtained from the Grampian Co.'s lines. Mr. Roberts, who owns the estates, has purchased an electrically driven portable threshing mill for the joint use of the farmers.

Walsall.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains and erect a sub-station in Goscote Lane at a cost of £1,460.

Walton-on-Thames.—LIGHTING A BY-PASS ROAD.—Electric-discharge lighting equipment made by the Edison Swan Electric Co., Ltd., is being used in New Zealand Avenue, a new by-pass road at Walton-on-Thames. Fourteen 32-ft. weldless tubular steel poles with 5-ft. extension tubular bracket arms have been erected to carry the "Jubilee" lanterns. The optical system of the lantern consists of a combination of prismatic refractors and special chromium-plated

Electric-discharge lighting at Walton-on-Thames

reflectors giving non-axial distribution of light. There is also an internal top reflector to control the light in the upper zones. The poles and brackets have been specially painted white and green to render them conspicuous at night. The lanterns themselves are finished in green, and are fitted with 400-W "Escura" electric-discharge lamps. The installation was carried out in co-operation with the Council's surveyor and the electrical engineer (Mr. E. A. Anderson).

Watford.—NEW EQUIPMENT.—Sanction has been obtained by the Electricity Committee to borrow £14,341 for power station buildings, £7,500 for sub-station plant, and £1,000 for additional cooling facilities at the power station.

Weymouth.—METER TESTING.—The borough engineer has been asked to prepare plans for the erection of buildings for meter testing, repairs and storage.

Wigton (Cumberland).—RURAL SUPPLIES.—A start is to be made in supplying electricity to the south-eastern section of the Wigton rural area. Plans have been prepared by the

Electricity in Madras

STEADY progress during 1934/5 is reported by Mr. H. G. Howard, the chief electrical engineer of the Madras Government Electricity Department. Extensions have been made to the Pykara hydro-electric system, which has now completed two years' operation, and although the abnormally dry season gave rise to some anxiety the storage arrangements proved to be sufficient for requirements. The increased load, however, was such that it was considered desirable to begin work on the construction of the Mukurti dam with a view to providing 230,000,000 cu. ft. of storage by the end of the year. The load and revenue situation of the Pykara system is satisfactory; only one of the oil-engined mills in operation when the scheme was started has not yet been changed over to electric drive.

Latest figures for the Pykara system show that the demand on the power station rose from 3,150 kW in 1933-34 to 6,600 kW this year, while the amount of electricity distributed increased threefold (from 9,669,203 to 29,697,347 kWh). Gross revenue in 1934-35 was Rs.10,37,972 (compared with Rs.4,42,784) and working expenses Rs.2,81,616 (Rs.2,70,845), leaving a balance of Rs.7,56,356 (Rs.1,71,935). After paying all charges except depreciation there is a surplus of Rs.57,856.

Every effort has been made to render retail tariffs for electricity more uniform throughout the Presidency. In an attempt to improve the efficiency of electricity supply the conditions attached to the grant of a licence have been made more rigorous, but it has not been found possible to enforce the reasonable financial and administrative control which is so necessary if a real improvement is to be made and standardisation of rates and conditions of service approached.

A survey of the electricity undertakings in the Presidency reveals in many cases mismanagement, absence of a sound commercial policy, lack of experienced supervision, and often inefficiency. These remarks apply in part or in whole to a majority of municipal undertakings and to a large proportion of the private ventures. Experience has led Mr. Howard to the conclusion that muncipal councils in this province at present find it difficult to manage and direct local electricity undertakings in a manner which will ensure healthy electrical development and a maximum of benefit to the community. Even the most efficient councils leave much to be desired in that respect.

Progress in municipal schemes has been satisfactory, the most marked increase in load being at Tiruppur, where the increase in cotton is reflected in the added ginning load. Coimbatore, Tiruppur and Pollachi municipalities contemplate extending their street lighting next year. Advance at Palghat is slow, and Erode, too, is backward.

Mid-Cumberland Electricity Co., and are now before the Rural District Council.

Wilmslow.—ELECTRICITY IN COUNCIL HOUSES.—The Urban District Council has decided to have electric lighting installed in Council houses at Highfield and Lindfield, an extra 4d. to 5d. per week being paid by the tenants for ten years to cover the cost.

Worthing.—OVERHEAD EXTENSIONS.—The Rural District Council has decided to offer no objection to the erection of overhead lines by the Mid-Southern Utility Co., Ltd., from Fittleworth to Lyminster, *via* Bury and South Stoke, and at Houghton.

Traction

Aberdeen.—TRAMWAY FINANCES.—In his annual report on the working of the Transport Department, Mr. A. Smith, the general manager, states that the revenue from the tramways fell by £1,596 to £150,017, while the working expenses increased by £1,195 to £113,990. The net profit was £8,637. Although there was an increase of 67,180 in the car mileage, the number of passengers carried was 37,831,000 compared with 38,256,000 in the previous year.

Argentina.—FIRE AT "UNDERGROUND" STATION.—The Diagonal Norte station on the new Spanish subway between Plaza Constitucion and Retiro in Buenos Aires has been almost destroyed by fire, and the damage is estimated at $100,000 (paper). This subway was opened in November, 1934, but almost immediately the Municipality ordered its closure as the constructional work and operation were considered unsatisfactory. Part of it was re-opened in April last.

France.—RAILWAY ELECTRIFICATION.—According to *La Traction Electrique* the French State Railway authorities have recently commenced preliminary operations in connection with the electrification of the Paris-Le Mans section (about 130 miles) of the Paris-Brest railway. The section will be operated at 1,500 V d.c. supplied by overhead lines. Thirteen automatic sub-stations equipped with mercury rectifiers are to be erected in the section to supply about 310 miles of main track and 125 miles of sidings. For express passenger trains 3,000 h.p. electric locomotives capable of a maximum speed of over 90 m.p.h. will be employed and 1,600 h.p. engines for local and goods trains.

Germany.—BIG ELECTRIFICATION PROGRAMME.—Sanction has been granted to the German State Railways to proceed with the conversion to the 15-kV single-phase system of the main line from Nürnberg to Halle and Leipzig, a distance of 220 route-miles. Altogether about 600 track-miles will be converted, and the entire scheme is to be completed within four years at an estimated cost of Rm. 114 million, of which 46 million will be spent on new rolling stock.

Hull.—ELECTRIC VEHICLES.—The Cleansing Committee recommends the purchase of six 3-ton electric vehicles.

Italy.—TRACK-LAYING.—Electric track-laying machinery has been introduced by the Italian State Railways for an extensive relaying programme covering the renewal of 700 miles of line. On the 3,000-V d.c. electrified sections these machines are fed direct from the overhead contact line.

London.—HACKNEY.—The Borough Council proposes to borrow £30,644 for electric vehicles and plant for the collection and disposal of refuse.

NEW TOWER WAGONS FOR THE L.P.T.B.—A fleet of eight tower wagons incorporating A.E.C. "Mercury" forward-control chassis driven by heavy-oil engines has recently been placed in service by the London Passenger Transport Board for the maintenance of trolley-bus and tramway overhead conductors. Increased comfort and protection from the weather are given to the driver and linesmen, the former having a fully enclosed cab with a deep sliding window to give good vision to the rear of the vehicle. In the main cab lockers with seats above them are fitted on the off side, while on the near side there are entrance door and bins for material. The tower is built in three sections and can be readily detached from the chassis. When fully extended it rises to a height of 22 ft. above the road level, and the lifting gear may be operated either by a power take-off from the gear box or by hand. A work bench is fitted at the rear of the tower structure.

TRANSPORT SCHEME PROBLEMS.—Discussing the proposed large electrification scheme for which a sum of not more than £40,000,000 is being guaranteed by the Government, *Modern Transport* points out that two of the tube railways to be connected with main lines have electrical arrangements which do not conform with the remainder of the L.P.T.B. railway system. The Central London Railway, which is to be linked with the L.N.E.R. Loughton and Fairlop lines, employs a positive rail placed centrally in the 4-ft. way, with running rail return, while the Northern City section, extension of which north of Finsbury Park to the L.N.E.R. High Barnet branch suburban stations is contemplated, has positive and negative conductor rails placed outside the running rails on each side. The remainder of the mileage upon which London Transport electric trains operate is equipped with the third and fourth rail system, with the positive rail outside and the negative rail between the running rails. Conversion of the Northern City line will therefore be necessary, since Edgware-Morden line trains are to share in the operation of the L.N.E.R. High Barnet group of branches, while conversion of the Central London section may well be undertaken for the sake of uniformity and the possibility of further inter-railway working.

Lytham St. Annes.—FUTURE OF TRANSPORT UNDERTAKING.—The Council has decided to defer acceptance of Blackpool Corporation's suggestion to effect a transport merger in order to introduce a scheme embracing the co-ordination of the transport undertaking in the two towns. A suggestion is that Blackpool and Lytham St. Annes should run a fleet of buses jointly into the latter borough in preference to Blackpool taking over Lytham St. Annes' undertaking completely.

Russia.—THE MOSCOW UNDERGROUND RAILWAY.—According to the Moscow correspondent of the *Manchester Guardian*, the plans for the second section of Moscow's "Metro" will be considerably modified to introduce features of the London Underground railway system. The assistant chief engineer, Mr. Abakumoff, praises the durable and economical architecture of the London "Underground," its safety, and its planning, criticising only the lack of bright and luminous colours in the stations. As a result of the observations in London the tunnels under construction in Moscow will be narrowed from six and a half to four and a half yards. Escalators on the London plan will be built.

Sunderland.—TRAM TRACK.—The Town Council has decided to lay a tram track along a new road between Fulwell and Seaburn at an estimated cost of £16,386.

United States.—FASTER TRAIN SERVICES.—The Pennsylvania Railroad has greatly accelerated its New York to Washington services since this route was electrified, and the Congressional Limited now covers the 225 miles in 225 minutes, including six intermediate stops, and forty-two other passenger trains do the distance at average speeds of 54 m.p.h. or more, including one to six stops. On the Atchison, Topeka and Santa Fé Railroad the new 3,600 h.p. Diesel-electric locomotive (claimed to be the most powerful in the world) is reported to have reached 110 m.p.h. in the course of a journey from Chicago to California.

Communications

France.—LOUDSPEAKING TELEPHONES FOR COLLIERIES.—An installation of loudspeaking telephones has recently been completed at two of the collieries of the Compagnie des Mines d'Anzin in the Nord Department of France by the Société des Ateliers de Constructions Electriques de Charleroi.

RADIO LYONS.—The new 25-kW Radio Lyons broadcasting station was inaugurated on October 5th, on a wavelength of 215.4 metres.

Great Britain.—TELEVISION.—It is reported that the British Broadcasting Corporation's television plans for next March include transmissions for three separate hours daily, using the Baird and Marconi-E.M.I. systems on alternate weeks.

NORTH-EAST REGIONAL TRANSMITTING STATION.—The B.B.C. announces the purchase of a site near Newcastle for the North-East Regional station. A number of sites have been tested, but the choice was restricted to some extent by the necessity of avoiding the area surrounding Hadrian's Wall, which is preserved as an ancient monument. The site chosen is at Bewclay, near Corbridge, about sixteen miles west of Newcastle. Preliminary work in connection with the construction of the station is in hand.

Manchukuo.—RADIO TELEPHONY.—It is reported that the Manchuria Telegraph & Telephone Co. is preparing plans to establish a radio telephone service with the United States. It is hoped to use the Hsinking broadcasting station as the transmitting centre and to relay to America through Japan.

Norway.—BROADCASTING SERVICES.—Our Scandinavian correspondent states that the State broadcasting engineers have drafted a plan (called the Great National Plan) by which several stations would be replaced by new ones, while the power of others would be increased. These measures would increase Norway's total broadcasting power output from 92 kW to 186 kW. The plan comprises one national transmitter, nine large regional stations, and ten local relay stations. The larger stations are planned as follows:—Oslo, 60 kW; Kristiansand, 20 kW; Stavanger, 10 kW; Bergen, 20 kW; Aalesund, 10 kW; Nidaros, 20 kW; Bodo, 5 kW; Tromso, 10 kW; Finnmark, 10 kW; and Lamberseter (overseas s.w. broadcaster), 25 kW. The Government has granted a sum of 50,000 kroner for experiments with a view to the construction of a Norwegian "people's" receiver, and two simple two-valve sets have been designed, one for headphones and the other for loud-speaker reproduction.

A NEW OSLO-VADSO LINK.—Recently a h.f. cable more than 2,200 km. long has been completed between Oslo and Vadsö by Standard Telephones & Cables, Ltd. The new cable has an equal and distortionless response over the whole range from 30 up to 8,000 cycles, and has already proved highly efficient in use. It contains two telegraphy channels, nine ordinary telephony (speech-frequency) channels, and a broadcasting channel.

Rushden.—RADIO INTERFERENCE FROM PUBLIC BATHS.—Interference with radio reception at Rushden has been traced by the Post Office Engineering Dept. to chlorinating plant at the public baths, and the Urban District Council has agreed to install suppression apparatus.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—November 14th. Electricity Department. Two 200-kVA transformers. (See this issue.)

Aldershot.—November 5th. Electricity Department. Four 250-kVA transformers. (See this issue.)

Australia.—BRISBANE.—November 26th. City Electric Light Co., Ltd. Switchgear, including control panels, instrument transformers, switches, circuit-breakers, &c., for the Bulimba power station. (T.Y. 10150.)*

Birmingham.—November 5th. Electric Supply Department. Motor convertors. (October 11th.)

Clitheroe.—November 4th. Electricity Department. Three switchboards. (October 18th.)

Dewsbury.—October 29th. Corporation. Electric wiring of twenty-six houses at Earlsheaton. Borough electrical engineer, Bradford Road.

Dumfries.—October 31st. Town Council. Electric lighting at forty-eight houses at Milldamhead. Burgh surveyor.

East Grinstead.—October 29th. U.D.C. 6,600-V outdoor substation equipment. (October 18th.)

Glasgow.—Public Assistance Department. Fire alarm apparatus and wireless equipment. (October 18th.)

Grimsby.—November 6th. Electricity Department. L.p. cables. (See this issue.)

Harefield.—November 11th. Middlesex County Council. Automatic telephone system, cabling and instruments, &c., for the County Sanatorium. (October 18th.)

Harwich.—November 11th. Electricity Department. E.h.p. and l.p. switchgear, e.h.p. switch kiosk, and transformers. Supply, laying and jointing of 5,500 yards of 6,600-V cable. (See this issue.)

Hastings.—November 4th. Electricity Department. Transformers, poles, galvanised steelwork, &c. (October 18th.)

Hazel Grove and Bramhall.—October 31st. Electricity Department. Sub-station l.p. switchgear. (October 18th.)

Holbeach.—November 21st. Holland C.C. Engineering works in connection with Holbeach Institution. (October 18th.)

Hull.—November 7th. Electricity Department. Electrical accessories for assisted wiring scheme. (See this issue.)

India.—NEW DELHI.—November 28th. Stores Department. Flameproof electric cables as required under an annual rate contract. (T.Y. 10155.)*

Lanark.—October 29th. County Council. Various works, including electrical, at 150 houses at Cambuslang. P. C. Smith, County housing and town planning engineer, 13, Clydesdale Street, Hamilton.

Langho (near Blackburn).—Lancashire Mental Hospitals Board. Electrical installation for extensions to Brockhall Institution. (October 18th.)

London.—STOKE NEWINGTON.—Electricity Department. Underground disconnecting boxes. (October 18th.)
H.M. OFFICE OF WORKS.—November 7th. Illuminated external hanging signs. (See this issue.)

New Zealand.—WELLINGTON.—November 25th. Posts and Telegraph Department. Ammeters, voltmeters, and high- and low-voltage relays. (T.Y. 10127.)*
November 14th. Telephone cable. (T.Y. 10171.)*
November 18th. Telephone cable. (T.Y. 10172.)*
January 21st. Battery plates, &c. (T.Y. 10175.)*
January 28th, 1936. Public Works Department. 50-kV switchgear and steelwork for Section 425 of the Arapuni scheme. (T.Y. 10154.)*
January 21st. 110-kV switchgear and steelwork for the Paraparaumu sub-station. (T.Y. 10152.)*
February 4th, 1936. Three 750-kVA oil-immersed self-cooled single-phase transformers (T.Y. 10176.)* 11-kV switchgear and metering equipment for the Paraparaumu sub-station of the Mangahao power development scheme. (T.Y. 10177.)*

Norwich.—Electricity Department. Turbo-alternator and condensing plant, water tube boilers, pipes, valves, &c., ash sluice conveyor and reclaiming plant, and 400-V and 3,300-V switchgear and transformers. (October 18th.)

Raunds (NORTHANTS).—October 28th. U.D.C. Electrically-driven centrifugal pumps and motors, elevated steel tank, spun-iron water mains and erection of small pump house. G. Whittam, surveyor, Brook Street (deposit £2 2s. in respect of latter item).

Solihull.—November 2nd. U.D.C. Vertical-spindle electrically driven centrifugal pumps, including motors, shafting, cast-iron pipes, float gear, switchgear, and electric wiring. R. Dunn, engineer, Council Offices.

South Africa.—PORT ELIZABETH.—November 14th. Municipality. Electrical material, comprising cables, transformers, poles and stays, motors, meters, demand indicators, time switches and lamps. (T.Y. 10167.)*

Staffordshire.—November 11th. Potteries Water Board. Two sets of electrically-operated rotary pumps: also one Diesel-driven d.c. generating set. P. Wilkinson, engineer, Staffordshire Potteries Water Board, Albion Street, Hanley, Stoke-on-Trent (deposit £5).

Uruguay.—MONTEVIDEO.—November 25th. State Electricity Supply and Telephone Administration. 75,000 40-W, 225-V, and 1,500 500-W, 225-V electric lamps. (T.Y. 10137.)*

Walkington.—October 29th. East Riding Mental Hospital Visiting Committee. Installation of electric lighting at mental hospital. (October 11th.)

Walsall.—November 11th. Electric Supply Department. Material and apparatus for the year ended December 31st, 1936. (See this issue.)

Wolverhampton.—November 11th. West Midlands J.E.A. Electrical installation for the extension of Ironbridge generating station. (See this issue.)

---

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Annfield Plain (Co. DURHAM).—U.D.C. Accepted. One 134-kVA transformer.—Hackbridge Electric Construction Co., Ltd.

Barrow-in-Furness.—Electricity Committee. Accepted. Switch panel (£169).—Metropolitan-Vickers Electrical Co., Ltd.
Health Committee. Accepted. Electric vehicle battery (£171).—D. P. Battery Co., Ltd.

Birkenhead.—Electricity Committee. Accepted. Wiring (assisted scheme): Sixty-two houses (£245).—Park Electrical Co. Forty-one houses (£169).—J. J. Peters.

Dartford.—Electricity Committee. Accepted. Kiosk transformer (£405).—Crompton Parkinson, Ltd.

Derby.—Electricity Committee. Recommended. Boiler unit and auxiliaries, chimney (containing latest type of separator for dust prevention), electrical precipitation plant, and modification of the boiler house buildings (£64,352).—International Combustion, Ltd. Steam feed and blow-down piping, valves, &c. (£2,269).—Aiton & Co., Ltd. Coal elevator and conveyor (£1,710).—Ewart Chain Belt Co., Ltd.

Ealing.—Electricity Committee. Accepted. Additional equipment at Ashbourne Road sub-station (£453).—English Electric Co., Ltd. Full equipment of Heathcroft sub-station (£663).—Ferguson, Pailin, Ltd. Cable (£800).—Enfield Cable Works, Ltd. Transformers.—C. A. Parsons & Co., Ltd. (£1,555); Ferranti, Ltd. (£518).

Kent.—Public Assistance Committee. Accepted. Electrical work in connection with the remodelling of Dover Institution (£1,125).—Stanhay & Co., Ashford.

Liverpool.—Electric Power and Lighting Committee. Recommended. Two 500-kV rectifiers required at traction sub-stations (£1,680).—Electric Construction Co., Ltd.
Passenger Transport Committee. Recommended. Gear for tramcars: Twenty-five car sets of bogie trucks, including brakes (£529 per car set).—Maley & Taunton. Twenty-five car sets of motor equipment, each including four motors complete (£560 per set).—General Electric Co., Ltd. Twenty-five car sets of electrical control gear, including controllers, resistances, circuit-breakers, &c. (£283 per set), and fifty car sets of motor equipment and electrical control gear, each including two motors, circuit-breakers, resistances, &c. (£411 per set).—Metropolitan-Vickers Electrical Co., Ltd. Fifty car sets of air-brake equipment for four-wheel trucks (£197 per set).—E.M.B. Co., Ltd.

London.—BATTERSEA.—Accepted. Electrical installations at the new Battersea grammar school.—Alpha Manufacturing & Electrical Co., Ltd.
L.C.C. Housing and Public Health Committee. Accepted. Wiring and fittings for electric lighting at housing estates: Browning estate, Southwark (£914) and Clapham Park estate (£1,242).—Jacob, White & Co., Ltd. Dinmont estate, Bethnal Green (£781).—E. Dyne & Co., Ltd. East Dulwich estate (£1,929).—Buchanan & Curwen, Ltd.
HAMMERSMITH.—Electricity Committee. Recommended. Six single-phase air-cooled transformers (£1,313).—British Electric Transformer Co., Ltd.
ST. MARYLEBONE.—Electricity Committee. Recommended. Oil-immersed transformers for twelve months.—British Thomson-Houston Co., Ltd.; British Electric Transformer Co., Ltd. Switchgear for twelve months.—Ferguson, Pailin, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
ST. PANCRAS.—Contracts and Stores Committee. Recommended. Four 750-kVA transformers (£392 each).—Fuller Electrical & Manufacturing Co., Ltd.

Newburn-on-Tyne.—U.D.C. Accepted. Generating plant at the new child welfare and maternity centre at Throckley (£259).—Kohler Co., Ltd.

Northern Ireland.—MAGHERAFELT.—Board of Guardians of the Magherafelt Union. Accepted. Electric lighting system at the workhouse, infirmary and fever hospital (£115).—J. S. Loughan, Larne.

Portland.—Housing Committee. Accepted. Wiring Council houses at Avalanche Road and Weston No. 2 (£155).—Marshall & Sons.

Watford.—Electricity Committee. Recommended. Cables for twelve months.—W. T. Henley's Telegraph Works Co., Ltd.; Telegraph Construction & Maintenance Co., Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, October 25th. Grand Hotel, Birmingham. 7 p.m. "The Use of Auxiliary Commutator Motors for Power Factor Correction." Mr. P. A. Mossay.

Institution of Mechanical Engineers.—Friday, October 25th. Institution, London. Presidential address by Col. A. E. Davidson.

Junior Institution of Engineers.—Friday, October 25th. 39, Victoria Street, S.W.1. 7.30 p.m. Informal meeting. "Luminous Discharge Tubes." Mr. C. C. Paterson.

Leicester Association of Engineers.—Friday, October 25th. Leicester College of Technology. 7.30 p.m. "Electrical Development in Russia." Mr. A. Monkhouse.

Institution of Electrical Engineers.—Monday, October 28th. Institution, London, 7 p.m. Informal meeting. Discussion on "Can We Practise What We Preach?" To be opened by the President. (*Bristol Students' Section*).—Friday, October 25th. Pavilion Ballroom, Bristol. Annual dance. (*East Midland Sub-Centre*).—Friday, October 25th. Victoria Hotel, Nottingham. Annual dinner. (*North-Eastern Centre*).—Saturday, October 26th. 1.45 p.m. Visit to the Dunston Power Station. Monday, October 28th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Recent Progress in Induction Motor Construction." Mr. L. H. A. Carr. (*North Midland Centre*).—Tuesday, October 29th. Hotel Metropole, Leeds. 7 p.m. "The Droitwich Broadcasting Station." Sir N. Ashbridge, H. Bishop and B. N. MacLarty. (*North-Western Students' Section*).—Tuesday, October 29th. Engineers' Club, Manchester. 7.15 p.m. "Lightning, You and I." Mr. J. E. L. Robinson. (*Scottish Centre*).—Tuesday, October 29th. 39, Elmbank Crescent, Glasgow. 7.30 p.m. Chairman's address by Mr. J. B. Mavor. (*South Midland Students' Section*).—Tuesday, October 29th. James Watt Memorial Institute, Birmingham. 7 p.m. "Valve Oscillators." Mr. H. D. Bickley. (*Irish Centre*).—Thursday, October 31st. Trinity College, Dublin. 6 p.m. Chairman's address by Mr. W. Storey. (*West Wales (Swansea) Sub-Centre*).—Thursday, October 31st. Central Hotel, Swansea. 6.30 p.m. Chairman's address by Mr. C. G. Richards. (*Meter and Instrument Section*).—Friday, November 1st. Institution, London. 7 p.m. "The Design, Construction and Testing of Voltage Transformers." Mr. J. H. Buchanan. (*Transmission Section*).—Friday, November 1st. Georgian Restaurant, S.W.1. Conversazione, exhibition and dance.

Diesel Engine Users' Association.—Wednesday, October 30th. Caxton Hall, S.W.1. 3 p.m. Discussion on "Fuels for Diesel Engines."

Faraday House Old Students' Association.—Friday, November 1st. Savoy Hotel, W.C.2. 6.30 for 7 p.m. Annual dinner.

Royal Institution.—Friday, November 1st. Institution, London. 9 p.m. "The Liberation of the Electron." Mr. C. C. Paterson.

Association of Mining Electrical Engineers (*West Wales Branch*).—Saturday, November 2nd. Swansea. "Some Interesting Problems on Boiler Feed Water." (*Kent Sub-Branch*).—Saturday, November 2nd. Dover Technical Institute. 6.30 p.m. "Foundations and the Fixing of Machines Thereon." Mr. W. R. Howard.

Notes

The Birmingham Electric Club

The twenty-fourth annual dance of the Birmingham Electric Club was held at the Grosvenor Suite of the Grand Hotel, Birmingham, on Friday last, a company of about 470 being present, including many prominent Midland electrical engineers and their wives. The function was held under the presidency of Mr. J. H. Asdell, M.Sc., and during supper a memento of the occasion was distributed to each lady present.

Power Lines Near Aerodromes

The Federation Aeronautique de France has recently published a set of rules regulating the erection of electric power transmission lines and radio-broadcasting antenna supporting masts in the vicinity of aerodromes. The minimum distance from the aerodrome in which masts may be erected is 1,000 metres for a height of 20 metres. For every five metres of additional height, the distance is increased by 250 metres. Masts exceeding a height of any multiple of 5 metres must conform to the distance allotted to the next highest multiple. Lines supported on masts lower than 7 metres will be permitted at a distance less than 1,000 metres from the aerodrome, provided they are erected parallel to a line of trees and within at least 20 metres of houses of similar or greater height. Similar regulations apply to the erection of telegraph and telephone lines, the only exception being the lines connected with the aerodrome or aeronautical establishments, the supporting masts of limited height being then permitted nearer the aerodrome than 1,000 metres.

Oxidation and Scaling

A "Review of Oxidation and Scaling of Heated Solid Metals" has been brought out by the Metallurgical Research Board of the Department of Scientific and Industrial Research (Stationery Office, 2s. 6d.), which is a critical survey of existing knowledge of the subject. Its first four sections deal with the mechanism and the rate of oxidation in different temperatures and atmospheres and the nature and properties of oxide layers formed. The last two sections are concerned with the practical aspects of oxidation and scaling and the methods at present available for their control. The review also calls attention to certain problems upon which further research is necessary. In the last section ("Practical Aspects") electric heating, with especial reference to the bright annealing of nickel and nickel-copper alloys, is discussed. The importance of the elimination of sulphur from reducing atmospheres is emphasised and it is pointed out that the amount found in town's gas makes it unsuitable.

Heavy and Light Engineering

Mr. D. J. Bolton, the author of the article in our last issue bearing the above title, asks us to mention that the photographs which were reproduced with the article were taken by the Polytechnic School of Photography.

An Electro-medical Association

The Council of Physical Medicine, Ltd., has been formed as a company limited by guarantee without share capital with twenty-five members. Its objects are to protect the interests of the profession of registered medical auxiliaries and all other qualified persons engaged or connected with medical electrical therapy, &c. The solicitors are Messrs. Ranger, Burton & Frost, 179, Queen Victoria Street, E.C.

The Manchester Electro-Harmonic Society

The Manchester Electro-Harmonic Society commenced its 1935-36 season last Friday when a smoking concert was held at the Waldorf Hotel, Cooper St., Manchester. Mr. J. H. Farthing, A.M.I.E.E., who is this year's president, occupied the chair. Visitors to Manchester who have made a practice of attending the Society's functions will again be welcomed at any of the forthcoming meetings which are to be held on the following dates:—November 22nd, December 20th, January 17th, February 21st, March 20th. It has been decided to hold the ladies' evening on January 25th in the main hall of the "Manchester Limited" Restaurant, Cross Street. This takes the place of a dinner-dance, and it is expected that this function will be on the lines of the ladies' evenings which have been a feature of the Society for the last six or seven years. Full particulars as to the activities of the Society can be obtained from Mr. C. E. Leak, secretary, 10/12, Cateaton Street, Manchester.

Electric Heat

The latest brochure issued by the Industrial Heating Committee of E.D.A. (Electric Heat No. 5) deals with the treatment of non-ferrous metals. As this committee includes experts on all applications of electric heating for industrial and commercial purposes, the offer of advice free of charge to prospective users should find ready acceptance. The present publication sets out the case for electricity in the field covered (which includes annealing, bright annealing and aluminium alloys) in readily understandable language and contains a number of photographs of actual installations that emphasise the arguments. Due recognition is paid to the need to take other factors into account besides B.th.u. consumed; *i.e.*, comparisons with other methods must be made on the basis of overall efficiency.

The New E.R.A. Laboratory

The exhibits demonstrated at the opening of the new E.R.A. laboratory, described on page 566, have attracted such widespread attention that in response to representations it has been decided to afford those members and guests who were unable to be present at the opening, facilities to view during the week ending Wednesday, October 30th.

An Efficiency Award

As a result of tests conducted by Russian engineers the American General Electric Co. has earned a bonus for exceeding its guarantee of efficiency for the five hydro-electric generators which it supplied to the hydro-electric power station at Dnieprostroy. The tests were conducted under the direction of Prof. P. Tolvinsky, of the Leningrad Polytechnic Institute. One of the 13,800-V, 88.2-r.p.m. generators showed that at full load (77,500 kVA or 62,000 kW at 0.8 power factor) the efficiency was 97.91 per cent. The calculations for all the five units showed an average full-load efficiency of 97.87 per cent.

Radio Data Charts

The *Wireless World* has published a second edition of "Radio Data Charts" by R. T. Beatty, M.A., B.E., D.Sc. It comprises a series of abacs, brought abreast of the latest developments, which enables the experimenter to arrive rapidly at technical results which would otherwise involve much laborious calculation. The charts can be obtained at 4s. 6d. net (postage 4d.) from Iliffe & Sons, Ltd., Dorset House, Stamford St., S.E.1.

Appointments Vacant

Meter fixer for Workington Electricity Department.

Showroom assistant (male) for Portsmouth Electricity Department.

Motors and hiring superintendent for Birkenhead Electricity Department.

Technical assistant for the Chief Superintendent of Ordnance Factories, Royal Arsenal, Woolwich, S.E.

Assistant area engineer for the London & Home Counties J.E.A.

(See our classified advertisements.)

Makers' Names Wanted

M.L.W. lampholder.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. G. G. L. Preece, sales manager to Messrs. Bruce Peebles & Co., Ltd., for the north of England and Wales, has been appointed sales manager of the company. He took up his residence at Edinburgh on Monday last, October 21st, and his headquarters will be at the head office and works of the company. Mr. Preece is a member of the Institution of Electrical Engineers, and was chairman of the North-Western Centre for the 1933-34 session. He is also a member of the Institution of Mining Engineers. Mr. Preece is a nephew of the late Sir William Preece, and an account of his career will be found in the ELECTRICAL REVIEW for October 20th, 1933 (p. 547). **Mr. H. V. Balm,** who was formerly assistant to Mr. Preece in Manchester, has been appointed in charge of the interests of Messrs. Bruce Peebles & Co. in the Manchester district (approximately Lancashire, Yorkshire, Cheshire and North Wales) with headquarters at 2, Brazil Street, Manchester 1. **Mr. R. P. Hilton,** A.M.I.E.E., has been appointed from Edinburgh to the London office of Messrs. Bruce Peebles & Co., 10, Norfolk Street, Strand, W.C.2, of which he will be in charge jointly with **Mr. H. E. Webb,** A.M.I.E.E.

[*Elliott & Fry*
Mr. G. G. L. Preece

Mr. C. Penn-Hughes, a director of the Hackbridge Electric Construction Co., Ltd., and only son of Mr. W. W. Penn-Hughes, the managing director, was married on October 12th at the Church of St. Clement Danes, Strand, London, to Miss Heather Seymour Guinness, of Hayes Groye, Hayes, Kent.

Mr. E. G. Globe, pier electrical engineer at Southend-on-Sea, has been granted an honorarium of £50 by the Corporation for his services in connection with the pier illuminations.

Mr. F. H. Souden, A.M.I.E.E., 27, Reid Park Road, Jesmond, Newcastle-on-Tyne, has been appointed representative of Messrs. M. & C. Switchgear, Ltd., for Northumberland, Durham, Westmorland and Cumberland, in place of Messrs. J. E. Favell & Co., Newcastle-on-Tyne.

The Wallasey and Birkenhead Electrical Trades Golfing Society held its final meeting of the season at the Leasowe Golf Club on October 17th. Following the competition for the "Cryselco" cup and replica, which was won by **Mr. F. Paulson,** nearly 100 members and visitors attended a "hot-pot" supper and entertainment. Mr. K. R. Mackley distributed the prizes. Mr. F. Paulson's score was 75 off a handicap of 16. Actually, Mr. A. Hawkins tied with a similar score, the winner being decided by the best score over the last nine holes. Messrs. G. A. Trace, F. R. Hunter, R. L. Scott and W. Foster secured the prizes in class A (handicaps scratch to 18), while the winners in class B (handicaps 19 and over) were Messrs. A. Hawkins, W. A. Maddocks and W. A. Snelson. Mr. W. Hobson took the visitors' prize, Mr. E. G. Cahill the award for the best net score off a handicap of 22 or over, Mr. Tom White the putting prize with 36 for eighteen holes, Mr. J. Mackenzie the best gross score award, and Mr. T. K. Fell the prize for the best return for four sealed holes. Mr. Mackley stated that the membership of the Society was 72, an increase of nearly 50 per cent. on the season. At the annual general meeting Mr. K. R. Mackley was re-elected president; Mr. R. M. Davies hon. secretary, and Mr. D. G. Igoe hon. treasurer. Mr. T. Whyte was chosen to succeed Mr. Vines as captain. Mr. Davies, the hon. secretary, was presented with a suitably inscribed wristlet watch in recognition of his services to the society.

Mr. K. R. Mackley, president of the Wallasey and Birkenhead Electrical Trades Golfing Society, presenting the "Cryselco" challenge cup to Mr. F. Paulson, the winner. Left to right: Messrs. K. R. Mackley, E. Tyldesley, C. E. Vines, F. Paulson, H. A. Deacon (donor of the cup) and T. White

Mr. D. P. Sayers, B.Sc., A.M.I.E.E., the author of the article on the change-over in Northern Ireland which appears on page 559, graduated at Birmingham University in 1923, and in 1924 joined British Insulated Cables, Ltd. In the same year he was appointed mains construction engineer to the Blackburn Corporation, and in 1928 became senior assistant to Messrs. G. V. Twiss & Partners, being responsible for carrying out rural development schemes in various parts of the country. Since 1930 he has been with Messrs. Kennedy & Donkin. For the first year he was engaged on C.E.B. work, and later he went to Northern Ireland where he has since been in charge of all the constructional work carried out for the Northern Ireland electricity scheme.

[*Elliott & Fry*
Mr. D. P. Sayers

Mr. G. A. F. Alison, foreman electrician, and **Mr. R. S. Goddard,** showroom superintendent, were recently presented with gifts from the employés of the Paisley Corporation Electricity Department. Mr. J. E. Adam, engineer and manager, in making the presentations, explained that Mr. Alison, who had served the department for thirty-five years, was retiring, and that Mr. Goddard had been appointed to a post with the Dundee Corporation Electricity Department.

Mr. C. Turnbull, who recently retired from the position of borough electrical engineer at Tynemouth, has been presented with a radio receiver by members of the Corporation Electricity Committee. The presentation was made by Councillor H. D. Burton, the Mayor of Tynemouth.

Mr. F. C. Orchard, A.M.I.E.E., assistant on the engineering staff of the Birmingham Corporation Electric Supply Department, has been appointed borough electrical engineer of Hornsey. Mr. Orchard went to Birmingham in 1923 as assistant to the eastern district mains engineer, and in consequence of his success in the I.E.E. examination in 1925 was transferred to the Substation Department as assistant in charge of maintenance of the automatic rotary convertor and mercury-arc rectifier substations. Two years later he was promoted to take charge of the construction of the automatic rotary and rectifier sub-stations, and subsequently was appointed to the special frequency-change staff to take charge under the frequency-change engineer of the changing-over of all the Department's sub-stations from 25 to 50 cycles.

Mr. F. C. Orchard

Mr. H. Hobson, whose address as president of the A.S.E.E. was dealt with in our last issue, is general manager of the Central Electricity Board, not *commercial* manager as was stated. The latter position is, of course, held by **Mr. J. W. Beauchamp.**

[Elliott & Fry

Mr. G. V. Boys

Mr. G. V. Boys, A.M.I.E.E., of Messrs. Kennedy & Donkin, has been appointed secretary of the Institution of Naval Architects, and will shortly take up that position in succession to Mr. R. W. Dana, who is retiring at the end of the current year after thirty-four years' service as secretary of the Institution. Mr. Boys is a son of Sir Charles Vernon Boys, and is a graduate of Trinity College, Cambridge. During the war he served in the Royal Engineers, and was one of the founders of the Cambridge University Engineering Society. He has been on the staff of Messrs. Kennedy & Donkin, consulting engineers, for the past fourteen years.

The Crewe Town Council has passed a resolution recording its appreciation of the valuable services rendered to the borough by the retiring borough electrical engineer, **Mr. H. H. Denton**, over a period of thirty-five years. Mr. Denton went to Crewe in 1900 from the Kensington & Knightsbridge Electric Lighting Co., Ltd., with whom he was resident engineer.

Mrs. C. E. Mortimer Hawkins is the secretary of the West Kent Branch of the Electrical Association for Women, whose inaugural meeting will be held at the Village Hall, Orpington, on October 31st. Mrs. Hawkins's address is "Wood Thorpe," Kingsway, Petts Wood, Kent.

Mr. G. H. Paulin, chief engineer of the internal combustion engine department of the English Electric Co., Ltd., has returned from Bermuda where he has been "checking up" the 2,500 h.p. unit installed by his company for the Bermuda Electric Light Co. in 1931. He found that the plant was operating very satisfactorily.

Miss Edna Pollard who, for some years, has been a member of the staff of the Bingley Urban District Council's electricity undertaking was, on October 8th, married to Mr. J. C. Longbottom, of Bingley. Miss Pollard was also, for some time, the secretary of the Bradford Branch of the Electrical Association for Women. The staff of the Electricity Department and members of "Nalgo" presented her with an electric standard lamp, suitably inscribed. **Miss Elsie Jackson**, of Bingley, succeeds Miss Pollard.

Obituary

Mr. W. Hibbert.—The death is announced of Mr. Walter Hibbert, of Gainford, which occurred on October 19th. Mr. Hibbert was at one time at the Polytechnic, Regent Street, W., and was a contributor to the ELECTRICAL REVIEW some years ago. He became an associate of the Institution of Electrical Engineers in 1888, and an associate member in 1899.

Mr. S. Tillotson.—The death took place at Shildon recently of Mr. Sam Tillotson, electrical contractor, after a long illness. He had been in business for many years and took an active part in the life of the town and district.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

West African Power and Light Co., Ltd.—Private company. Registered October 14th. Nominal capital, £100 in £1 shares. Objects: To acquire the business and assets of the West African Electrical Development Co., Ltd., and in particular the Gold Coast & Ashanti Electricity Licence granted on May 23th, 1935, to prospect, explore and investigate the industrial and electric power supply of West Africa and elsewhere, to produce and supply electricity, &c. The subscribers are: H. J. Lamb, 7, Willow Way, Gt. Crosby, Lancs; and Miss A. Firmin, 146, High Park Street, Liverpool, 8. Secretary: A. D. Dean. Solicitors: Arthur D. Dean & Co., 28, Exchange St. East, Liverpool.

Wm. Clarke Electrical Contractors, Ltd.—Private company. Registered October 14th. Capital, £1,500 in £1 shares. Objects: To acquire the business of an electrical contractor, radio engineer and cycle dealer carried on by W. W. Clarke at 198, County Road, Walton, and 52, Aintree Road, Bootle, Lancs. The directors are: W. W. Clarke, 11, Hildebrand Close, Liverpool, 4 (permanent managing director), and one other. Registered office: 198, County Road, Walton.

Beaco Electrical Appliances Co., Ltd.—Private company. Registered October 16th. Capital, £1,000 in 700 "A" ordinary and 300 "B" ordinary shares of £1 each. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in electrical household articles, hair-dryers, vibrators, electrical and other appliances, &c. The first directors are K. Borchardt and F. H. Katz. Solicitors: Sutton, Ommanney & Oliver, 7, Great Winchester Street, London, E.C.

Piccadilly Electrical, Ltd.—Private company. Registered October 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in wireless and telephonic receiving apparatus and component parts, &c. The permanent directors are: L. H. Altaras, 2, The Beeches, West Didsbury, Manchester, and J. Calderon.

Ismay Refrigerating Co., Ltd.—Private company. Registered October 16th. Nominal capital, £20,000 in £1 shares. Objects: To carry on the business of engineers, manufacturers of refrigerators and other machinery, woodworkers and cabinet makers, &c. The subscribers are: J. Ismay, Braemore Lodge, Sundridge Avenue, Bromley, Kent; and W. Normelli, Eskilstuno, Sweden.

Hyatt's (Wembley), Ltd.—Private company. Registered October 16th. Capital, £1,000 in 2,000 ordinary shares of 1s. each and 900 6 per cent. non-cumulative preference shares of £1 each. Objects: To acquire the business of an electrical and radio engineer and contractor carried on by C. F. Hyatt at 1, Sudbury Park Parade, Harrow Road, Wembley. The directors are: C. F. Hyatt, 1, Sudbury Park Parade, Harrow Road, Wembley, and Mrs. A. K. Hyatt, 1, Sudbury Park Parade, Harrow Road, Wembley.

Foremost Electrics, Ltd.—Private company. Registered October 19th. Capital, £2,500 in £1 shares. Objects: To carry on business as electrical appliance suppliers, manufacturers of and dealers in all types of electrical and mechanical apparatus and equipment, household appliances, vacuum cleaners, refrigerators, heating and cooking appliances, radio and television apparatus, gramophones, &c. The first directors are: C. V. Godwin, A. H. Godwin, and R. F. Holland. Solicitors: Theodore Goddard & Co., 10, Serjeant's Inn, London, E.C.4.

Amplivox, Ltd.—Private company. Registered October 2nd. Capital, £1,000 in £1 shares (250 5 per cent. cumulative preference). Objects: To acquire the business now carried on by A. E. Stevens at 15, Old Rectory Gardens, Edgware, Middlesex, as "Amplivox," to manufacture, assemble and distribute aids to hearing for deaf or partly deaf persons, public address equipment, electro-medical apparatus, radio apparatus, lighting equipment and other electrical and acoustical apparatus, &c. A. E. Stevens, 15, Old Rectory Gardens, Edgware, Middlesex, is director and chairman. Registered office: 106, George Street, Portman Square, London, W.1.

Woolman (Electrical Contractors), Ltd.—Private company. Registered October 11th. Capital, £250 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, &c. The directors are: Mrs. P. Woolman, 6, Wetherby Road, Roundhay, Leeds, and two others. Secretary: Pauline Woolman. Registered office: 6, Wetherby Road, Leeds.

Read & Co. (Radio), Ltd.—Private company. Registered September 28th. Capital, £200 in £1 shares. Objects: To acquire the business now carried on as "Read & Co.," and to carry on the business of manufacturers and repairers of and dealers in electrical and mechanical apparatus and accessories, radio sets, &c. The directors are: Mrs. F. G. Lewis, Boscombe, Walton Road, Frinton-on-Sea, and two others. Registered office: 121, Cheapside, London, E.C.

Wynmore Radio, Ltd.—Private company. Registered September 27th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, importers, exporters and repairers of and wholesale and retail dealers in radio transmitting and receiving sets, gramophones, &c. The first directors are: C. Barker and E. Perrett, 187, Central Drive, Blackpool. Registered office: 187, Central Drive, Blackpool.

H.P. Radio Services, Ltd.—Private company. Registered October 5th. Capital, £100 in £1 shares. Objects: To carry on the business of wireless, television and electrical engineers and technicians, mechanical engineers, and manufacturers, &c. The subscribers are: G. W. Lawrence, "Riversleigh," Moss Lane, Bootle, and J. Kelly, 2, Gladstone Road, Seaforth. Solicitor: Alfred Bieber & Bieber, Liverpool and Manchester.

Returns of Electrical Companies

Concordia Electric Safety Lamp Co., Ltd.—The nominal capital has been increased by the addition of £30,000 in £1 ordinary shares beyond the registered capital of £70,000.

Allbright Electric Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 shares beyond the registered capital of £5,000.

A. S. E., Ltd.—The nominal capital has been increased by the addition of £1,250 in £1 shares beyond the registered capital of £750.

Streamline Radio, Ltd.—Particulars filed of debentures not exceeding £12,000 (including £10,000 already registered) authorised October 7th, 1935, charged on the company's property,

present and future, including uncalled capital, the amount of the present issue being £2,000.

Brunwec, Ltd.—Deposit on September 30th, 1935, of deeds of 23, Cumberland Street, St. Paul's, Bristol, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Novodyne Products, Ltd.—First mortgage debenture, dated September 25th, 1935, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: S. D. Hammond, 33, Hall Park Avenue, Westcliff-on-Sea. Second mortgage debenture, of same date, to secure £1,500 and such sum not exceeding £2,500 which the chargee may be called upon to pay to the Midland Bank, Ltd., under a guarantee. Property charged: The company's undertaking and property, present and future, including uncalled capital. Holder: Sir Frederic Senier, Kt., Terra Nova, Salisbury Road, Leigh-on-Sea.

Infra-Red, Ltd.—Debenture dated September 27th, 1935, to secure £161 and rent reserved under agreement dated May 25th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Legal & General Assurance Society, Ltd.

Lancashire Telephone Systems, Ltd.—Satisfaction to the extent of £3,450 (the unissued debentures having been cancelled) on September 24th, 1935, of debentures authorised February 1st, 1929, and registered February 13th, 1929. (According to the register of mortgages, the debentures registered February 13th, 1929, originally secured £4,000.)

British Power & Light Corporation, Ltd.—Capital, £2,800,000 in £1,000,000 preference stock and £1,690,616 ordinary stock and 109,384 ordinary shares of £1. Return dated May 24th, 1935. £1,000,000 preference and £1,690,616 ordinary stock taken up. £1,729,500 paid on £1,000,000 preference and £554,500 ordinary stock (including 8/9 premium on £400,000 preference stock). £1,136,116 considered as paid on £1,136,116 ordinary stock. Mortgages and charges, nil.

Cable & Wireless, Ltd.—Capital, £30,000,000 in £1 shares. Return dated May 29th, 1935. All shares taken up. £1,266,493 paid. £28,733,507 considered as paid. Mortgages and charges, nil.

Pye Radio, Ltd.—Capital, £180,000 in 600,000 deferred ordinary shares of 1s. and 150,000 preferred ordinary shares of £1. Return dated May 15th, 1935. All shares taken up. £161,500 paid on 230,000 deferred ordinary and 150,000 preferred ordinary shares. £18,500 considered as paid on 370,000 deferred ordinary shares. Mortgages and charges, nil.

Clowne Electric Supply Co., Ltd.—Capital, £3,000 in £1 shares. Return dated May 29th, 1935. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Seaton & District Electric Light Co., Ltd.—Capital, £30,000 in £1 shares. Return dated May 1st, 1935. All shares taken up. £30,000 paid. Mortgages and charges, nil.

East Suffolk Electricity Distribution Co., Ltd.—Capital, £50,000 in £1 shares. Return dated May 31st, 1935. 38,000 shares taken up. £38,000 paid. Mortgages and charges, £17,850.

Telephone Manufacturing Co., Ltd.—Capital, £250,000 in 1,000,000 shares of 5s. Return dated May 13th, 1935. All shares taken up. £250,000 considered as paid. Mortgages and charges, nil.

Maintenance Contracts, Ltd.—Capital, £3,000 in £1 shares (1,000 cumulative preference and 2,000 ordinary). Return dated May 1st, 1935. 1,000 cumulative preference and 1,600 ordinary shares taken up. £1,102 paid on 1,000 preference and 102 ordinary. £1,498 considered as paid. Mortgages and charges, £1000.

Devon Development, Ltd.—G. E. B. M. Smith, of 1, Athenaeum Terrace, Plymouth, ceased to act as receiver and/or manager on October 10th, 1935.

British Automatic Refrigerators, Ltd.—Debenture dated October 7th, 1935, to secure £30,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: National Provincial Bank, Ltd.

Battery & Hefford, Ltd.—Mortgage on 10, St. Helen Street, Derby, &c., dated October 7th, 1935, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Maxlume Lighting & Heating Co., Ltd.—Charge constituting a second mortgage on Arrol Works, Plume Street, Birmingham, and a floating charge on the company's undertaking and other property and assets, dated October 10th, 1935, to secure all sums due or to become due. Holders: Stonsolic Investments, Ltd., 108a, Cannon Street, London, E.C.

West Hampshire Electricity Co., Ltd.—Capital, £30,000 in £1 shares. Return dated May 31st, 1935. All shares taken up. £30,000 paid. Mortgages and charges, nil.

Steriphone Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 13th, 1935. 902 shares taken up. £402 paid, £500 considered as paid. Mortgages and charges, nil.

Electric Service Co. (Grimsby), Ltd.—Capital, £1,000 in £1 shares. Return dated May 15th, 1935. All shares taken up. £1,000 paid. Mortgages and charges, nil.

South East Yorkshire Light & Power Co., Ltd.—Capital, £120,000 in £1 shares. Return dated June 25th, 1935. All shares taken up. £120,000 paid. Mortgages and charges, nil.

Nelson Brothers, Ltd.—Capital, £2,000 in £1 shares. Return dated June 7th, 1935. 1,998 shares taken up. £1,998 paid. Mortgages and charges, nil.

British Mica Co., Ltd.—Capital, £5,000 in £1 shares (2,000 preference and 3,000 ordinary). Return dated June 13th, 1935. 885 preference and 2,194 ordinary shares taken up. £1,079 paid on 885 preference and 194 ordinary, £2,000 considered as paid on 2,000 ordinary. Mortgages and charges: £2,300 debentures and £650 mortgage.

E. W. Stockham, Ltd.—Capital, £1,000 in £1 shares. Return dated June 7th, 1935. All shares taken up. £200 paid, £800 considered as paid. Mortgages and charges, nil.

City Notes

The Utilities Power & Light Corporation.—The *Financial Times* says that in the course of the consolidated statement of this company and the Utilities Power & Light Corporation, Ltd., for the year ended June 30th last the dividends and the interest on loans and advances of the Greater London and Counties Trust are given as $2,952,750 and $69,964 respectively, interest and dividends from other companies, non-affiliated, $60,407, exchange profit on remittances from Greater London and Counties Trust on repayment of Sterling advances $49,934 and miscellaneous $13,278, making $3,146,333, less consolidated net loss of subsidiaries $154,899, leaving $2,991,434. The consolidated condensed statement of income for the year ended June 30th last of the Greater London and Counties Trust and its subsidiaries and controlled companies shows net operating revenue of £1,754,950, plus net contracting profit of £184,430, making £1,939,380. To this is added non-operating revenue, and after deducting expenses of the Greater London and Counties Trust, &c., there is a net income of £1,061,878.

Murex, Ltd.—Presiding at the annual meeting on October 17th Mr. G. P. Joseph (chairman) referred to their subsidiary, Murex Welding Processes, Ltd., which, he said, had made further progress during the past year. The company's enlarged works had been fully occupied and the profits were very satisfactory. The demand for their products had shown a further increase, and in anticipation of further expansion of the business they had purchased twenty-three acres of freehold land for future extensions. Their subsidiary had created from the year's profits an obsolescence fund and had sold half its interest in its Italian subsidiary. It had also acquired a substantial share interest in an Australian company manufacturing electrodes and welding plant. The report and accounts were adopted and resolutions were passed increasing the capital to £650,000 by the creation of 60,000 new ordinary shares of £1 each and capitalising £13,500 of the reserve for distribution as bonus shares.

The Electrolytic Zinc Co. of Australasia, Ltd., reports a gross profit for the year to June 30th last, after the transfer of £145,000 for depreciation, of £327,960 (Australian currency), as compared with £285,732 for the preceding year. The net profit, after taxes, &c., was £256,020, as against £234,798. A sum of £23,600 is carried to the credit of debenture sinking fund, £25,000 is allocated towards development and new plant for the West Coast Mines, and after deducting payments of dividends Nos. 24 and 25 (£164,000), £116,501 is carried forward. Since the close of the financial year dividend No. 26 was paid in September, absorbing £115,000. This covered the preference dividend for the half-year ended June 30th last, and also the dividend on the ordinary shares at 5 per cent. per annum (against 4 per cent. last year).

Radio Central Exchanges, Ltd., held its annual meeting on October 17th, when Mr. A. B. Winch (chairman), who presided, said that the revenue account for the year showed a balance of £1,929 and progress made had been highly satisfactory. The subsidiary companies had, with one exception, reached the dividend-paying stage. The South Wales interests had been consolidated into the South Wales Relay Central Exchanges, Ltd., from which they anticipated substantial profits in the next year. The companies under their control had increased the number of subscribers by 21 per cent. With regard to the new season's business, early in September the number of new subscribers had begun steadily to increase and had continued to do so.

Herbert Morris, Ltd., reports a profit of £67,206 for the year ended July 31st last as compared with £51,218 in the preceding year, to which is added £22,990 brought in and dividends from investments, making £93,255. It is proposed to pay a final ordinary dividend of 10 per cent., making 15 per cent. for the year, and to carry forward £27,506. The report states that the company's business has improved at home, and there has been a welcome increase in business from overseas. Contracts in hand are well in advance of last year's figures.

Erinoid, Ltd., reports a fall in the net profits from £45,158 for 1933-4 to £35,008 for the year ended July 31st last. It is proposed to pay an ordinary dividend of 10 per cent. (against 11½ per cent.) and to place £5,000 to general reserve and £1,000 to the staff fund. The balance carried forward is £6,746 against £8,444 brought in.

Ericsson Telephones, Ltd., is paying an interim dividend of 5 per cent., tax free, on the ordinary stock (against 6 per cent., less tax, for the previous year). In August last a capital bonus of 25 per cent. in ordinary 5s. shares was distributed and the whole of the ordinary share capital was converted into stock.

The Scottish Power Co., Ltd., recently issued 570,000 ordinary shares of £1 each, of which 538,333 were issued to existing holders at 32s., in the proportion of one new share for each six held. It is now stated that the remaining 31,667 shares have been placed privately.

The French Thomson-Houston Co.—The Paris correspondent of the *Financial News* reports that this company is holding a meeting on October 31st at which a resolution will be submitted reducing the capital by 50 per cent. It is not proposed to create any new shares.

Broadcast Relay Service, Ltd., has declared an interim dividend of 15 per cent., less tax, on the ordinary shares. This compares with an interim dividend of 9 per cent. in the previous year.

The Ever Ready Co. (Great Britain), Ltd., is paying an interim ordinary dividend of 10 per cent. (unchanged). The directors state that sales for the period from April 1st have been more than maintained.

W. T. Henley's Telegraph Works Co., Ltd., has announced an interim dividend on the ordinary shares of 1s. 6d. per share, less tax (unchanged).

Stocks and Shares

TUESDAY EVENING.

CHEERFULNESS and depression chase each other with swift alternations across the Stock Exchange markets, where Geneva and Rome continue to be the chief centres of investment attention. Speculation is branching out more freely into lines of its own. The buoyancy that had characterised shares in the Iron and Steel market gives some slight indication of subsiding, although with the prospect of a big rearmament programme to be put into force in the early future, public interest in the market is well sustained.

Cable and Wireless

On Monday last Cable and Wireless "A" ordinary stock opened with a burst of buoyancy on the strength of the satisfactory index figure for September. This proved to be the best for five years, so far as September is concerned, and it showed an increase of 5.2 per cent. over the figure of a year ago. The price of the "A" ordinary stock started at 27, bid, nearly two points up, but the jump attracted selling and the stock went back to 26, at which it shows a gain of 1 on the week. The "B" ordinary has advanced to 7¼ and the 5½ per cent. preference is 10s. better at 101. Lively animation has characterised the market this week, the "A" stock in particular being popular as a speculative medium. Nothing has been published relating to the vague talk, current ten days ago, as to the likelihood of an early payment of the arrears—9¼ per cent.—of dividend on the preference stock.

Globe ordinary is 2s. 6d. down at 13¾, in spite of the Cable and Wireless recovery. Great Northern Telegraphs at 39 have regained their decline of last week. Marconi-Marines are 6d. better and the Anglo-American group has also improved. American Telephone and Telegraph has put on a couple of points at 145¼. American utility and railroad issues started the week in cheery mood, but the tone developed hesitation upon a bout of New York selling.

Electricity Supply Shares

County of London ordinary at 54s. 6d. and Metropolitans at 51s., showing small rises in each case, indicate the trend of operations in the market for London electricity supply shares. The provincial and Scottish groups are both firm, Clyde Valley, for instance, being 1s. 6d. up at 41s. 6d. Midland Counties and Lancashires have improved. Edmundson's are a good market at 40s. 6d. Llanellys at 23s. 9d. show a few pence fall. The new Lancashire Electrics, with 11s. paid, are quoted at 16s. 9d. Palestine "A" ordinary, after being 46s., recovered to 47s.; the company's 4½ per cent. preference stand at 22s. British Power and Light are a few pence easier at 29s. 6d. In the debenture list, £10,000 County of London 5 per cent. 1964-72 stock is offered at 126¼, May and November interest. Of Midland Electric Corporation 3½ per cent. stock, 1964-73, £20,000 can be bought at 100½ free of stamp-duty.

Manufacturing and Equipment

The market for shares in the electrical and cable equipment companies shows quiet strength, reflecting a steady demand for shares and a readiness on the part of the investor to take what he is offered at anything like attractive figures. W. T. Henley's has declared the usual 1s. 6d. interim dividend, and the price of the shares has improved to 6¾. Ericsson Telephones ordinary shares are a shade harder at 30s. 6d. xd. on the announcement of an interim dividend of 5 per cent., tax free, on the whole of the issued ordinary stock. This goes against 6 per cent. less tax, in the previous year, which latter was followed by a dividend and bonus of 18 per cent. in all, making 24 per cent. for the year. The nominal value of the shares then was £1, but it will be remembered that the company recently converted these shares into ordinary stock of 5s. units. Johnson & Phillips have risen 3s. 3d. to 44s. 6d. on the hope that the interim dividend, due next month, will be 5 per cent. as against 2½ per cent. a year ago. For the last twelve months the total dividend was 7½ per cent. The current year's distribution, the optimists predict, may be 12½ per cent.; caution suggests a probable 10 per cent. Ever Ready ordinary rose 3d. to 22s. 3d.

Telephones and Telegraphs

International Automatic Telephone ordinary shares are 3s. 6d. higher at 41s. ex dividend; the A at 38s. have followed the same upward course, though more slowly. Telegraph Condenser ordinary at 55s. 9d. are better. Telegraph Manufacturing at 7s. 4½d. are ex dividend. Telephone and General Trust ordinary have also gone ex dividend, and are now 32s. 6d. The 7 per cent. preference hold their previous price at 29s. 6d. Anglo-Portuguese Telephones remain at 31s. Canadian Marconis eased off to 7s. 3d. after their recent advance.

Miscellaneous Matters

British Electric Traction deferred stock heads the list of rises this week with an advance of 45 points, the price now being 1095. Brazilian Tractions came into demand from Montreal. A scheme is proposed for thawing part of Brazil's frozen credits, and this is the nebulous reason given to account for the buying of Brazilian Tractions. Anglo-Argentine Tramways first and second preferences, of the nominal value of £5 each, changed hands this week at threepence apiece. For the £100 5 per cent. debenture stock, a seller took £3 and a buyer gave 3¼ on Tuesday.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend 1933.	Dividend 1934.	Price Oct. 22.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	3¾	—	3 17 6
City of London	1	7½	7½	37/-	—	4 1 0
Clyde Valley	1	7	8	41/6	+1/6	3 17 2
County of London	1	10½	10½	54/6	+6d.	3 17 1
Edmundson's 7% Pref.	1	7	7	35/-	—	4 0 0
Do. Ord.	1	7	8	40/6	+6d.	3 19 0
Elec. Dis. Yorkshire	1	9	9	46/-	—	3 17 9
Elec. Fin. and Securities	1	12½	12½	3¾	—	3 14 2
Elec. Supply Corporation	1	11	11	3⅛	—	3 11 10
Lancs Light and Power	1	7½	7½	37/-	+6d.	4 1 2
Lond. Assoc. Electric	1	—	—	34/-	—	4 2 4
London Electric	1	7	8	38/6	—	4 3 0
London Power deb. Red.	Stock	5	5	108½	—	4 12 4
Metropolitan	1	10	10	51/-	+6d.	3 18 5
Midland Counties	1	7	7	36/-	+6d.	3 17 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	32/6	+6d.	3 13 10
Do. 7% Pref.	1	7	7	34/-	—	4 2 2
Northampton	1	10	10	50/-	—	4 0 0
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	31/-xd	—	3 17 5
Scottish Power	1	8	8	40/-	—	4 0 0
South London	1	7	7	33/6	—	4 3 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/-	−6d.	6 16 4
Yorkshire Elec.	1	8	8	42/6	—	3 15 5

PUBLIC BOARDS.

Central Electricity, 1950–70	Stock	5	5	114	—	4 7 9
Do. 1955–75	„	5	5	117	—	4 5 6
Do. 1951–73	„	4½	4½	110	—	4 1 10
Do. 1963–93	„	—	3½	101	−1	3 9 6
London Elec. Trans. Gtd.	„	—	2½	94	—	2 13 2
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A	„	—	4½	120½	—	3 14 8
Do. do. B	„	—	5	125½	—	3 19 8
Do. do. C	„	3½	4	99	—	4 0 10
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	145½	+2	6 3 9
Anglo-Am. Tel. Pref.	Stock	6	6	115xd	—	5 4 4
Do. Def.	„	1½	1½	28	+¼	5 7 2
Cable & Wireless 5½% Pref.	„	2¾	4½	101	+½	4 2 0
Do. A. 7½% Ord.	„	Nil	Nil	26	+1	—
Do. B. Ord.	„	Nil	Nil	7½	−¼	—
Globe Tel. & Tel. Ord.	10	2½	3½*	13½	−½	2 12 4
Do. do. Pref.	10	6	6	13½	—	4 9 0
Great Northern Tel.	10	20	20	39	+¼	5 2 7
Marconi-Marine	1	10	7½	31/3	+3d.	4 16 0
Oriental Telephone Ord.	1	12	12	3⅛xd	+2/-	*3 18 4

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	9d.	−9d.	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	−9d.	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1095	+45	—
Do. do. Pref. Ord.	„	8	8	165	−5	4 17 0
Brazil Traction	100	—	—	7½	+½	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	97½	—	5 2 8
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	$500	5	5	35	—	—
Victoria Falls Ord.	1	20	20	3½	−⅛	—
West Riding	1	5	6½	40/9	—	3 4 0

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	60/-	—	5 0 0
Assoc. Elec. Ord.	1	4	6	34/6	+6d.	3 9 7
Do. Pref.	1	8	8	37/-	—	4 6 4
Babcock & Wilcox	1	6	8	49/6xd	—	3 4 9
British Aluminium Ord.	1	5	7½	42/6	—	3 10 7
British Insulated Ord.	1	15	15	4¾	—	3 8 8
Brush Ord.	Stock	Nil	Nil	41½	−1	—
Callender's	1	15	15	3¾xd	+9d.	4 1 4
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	—	12½	3½	+⅛	0 18 0
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	24/6	+3d.	2 17 1
Enfield Cable Ord.	1	25	25	4½	—	5 2 6
English Electric	1	Nil	Nil	16/3	—	—
Do. do. Pref.	1	Nil	Nil	22/6	+6d.	—
Ericssons Tel.	5/-	—	24	30/6xd	−6d.	—
Ever Ready	5/-	35	35	22/3	+3d.	7 17 4
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	10	3½	—	3 4 0
Henley's	1	30	30	6¾	+⅛	4 7 3
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	44/6	+3/3	3 7 6
Siemens Ord.	1	6½	4	22/6	—	3 11 1
Telegraph Construction	£1	Nil	Nil	23/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

36066. "Television reception arrangement." Radioakt-Ges. D. S. Loewe, and K. Schlesinger. December 24th, 1932. (435682.)

1934

6095. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 14th, 1933. (435697.)

6455. "Electric drive of air-screw propelled cars and the like suspended from overhead tracks." H. Fraser. February 28th, 1934. (435801.)

8350. "Electro-medical apparatus." V. Caesar. March 16th, 1933. (435547.)

8548. "Electric motor controllers." A. West & Co., Ltd., and W. J. Paddock. March 19th, 1934. (435551.)

8687. "Manufacture or production of junction boxes for use in connection with electrical wiring conduits." W. J. Garratt, H. Garratt and H. Wootton. March 20th, 1934. (Addition to 358632.) (435555.)

8778. "Wireless-signalling systems for aircraft." J. Robinson. March 20th, 1934. (435621.)

8875. "Insulating electrical conductors." W. W. Groves (I. G. Farbenindustrie Akt.-Ges.). March 21st, 1934. (435557.)

9165. "Electric motor control systems." General Electric Co., Ltd., and C. A. Maer. March 23rd, 1934. (435622.)

9219. "Electron-discharge devices." C. S. Bull. March 23rd, 1934. (435559.)

9250. "Radio-transmission arrangement, more particularly for short or ultra-short wave purposes." Radioakt.-Ges. D. S. Loewe. March 29th, 1933. (435561.)

9308. "Electrical signalling systems." Automatic Electric Co., Ltd., and P. N. Roseby. March 24th, 1934. (435564.)

9314. "Modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., and A. Banfi. March 24th, 1934. (435565.)

9315. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., W. E. Benham, and A. J. Young. March 24th, 1934. (435566.)

9317. "Picture and like telegraph systems." Marconi's Wireless Telegraph Co., Ltd., and S. B. Smith. March 24th, 1934. (435567.)

9378. "Terminal and battery connector." F. W. Berry and L. G. T. Hunns. March 26th, 1934. (435705.)

9420. "Electric-discharge devices." British Thomson-Houston Co., Ltd., and J. H. Mitchell. March 26th, 1934. (435709.)

9473. "Cathode-ray tubes." L. F. Broadway and W. F. Tedham. March 26th, 1934. (435623.)

9601. "Electrical indicating or indicating and recording systems." F. A. Honick. March 27th, 1934. (435624.)

9614. "Electrolytic coating of metals." J. H. Gravell. December 11th, 1933. (435773.)

9712. "Electric radiator surrounds." General Electric Co., Ltd., and C. R. Duncombe. March 28th, 1934. (435572.)

9858. "Television and like receiving systems." Marconi's Wireless Telegraph Co., Ltd., L. E. Q. Walker and W. E. Benham. March 29th, 1934. (Cognate application 29311/34.) (435814.)

9859. "Thermionic valve circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and E. F. Goodenough. March 29th, 1934. (435815.)

9860. "Thermionic valve circuit arrangements for use as electrical time-period devices." Marconi's Wireless Telegraph Co., Ltd., and A. J. Young. March 29th, 1934. (435816.)

9875. "Contact fingers for electric switches." British Thomson-Houston Co., Ltd. March 31st, 1933. (435626.)

10968. "Electric amplifying systems and the like." D. M. Johnstone and Baird Television, Ltd. April 11th, 1934. (435574.)

12430. "Electrical apparatus for heating air, particularly for apartments, rooms, ships' cabins, compartments of vehicles, or the like." G. B. Burnside. April 25th, 1934. (435629.)

13758. "Electric converting systems." British Thomson-Houston Co., Ltd. May 5th, 1933. (Addition to 374012.) (435577.)

14302. "Electric converting systems." British Thomson-Houston Co., Ltd. May 11th, 1933. (Addition to 33494/33.) (435775.)

15123. "Electrical hot-plates." General Electric Co., Ltd., and G. H. Ide. May 18th, 1934. (435776.)

15785. "Electroplating of metallic articles." J. Kronsbein and C. F. Neale. May 28th, 1934. (435631.)

18037. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Electrische Glühlampen). June 18th, 1934. (435581.)

18173. "Brake magnets." Landis & Gyr Akt.-Ges. July 12th, 1933. (435777.)

19792. "Television, telekinematographic and like apparatus." J. D. Percy and Baird Television, Ltd. July 5th, 1934. (435637.)

22193. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). July 30th, 1934. (435778.)

23199. "Reception of television and the like by cathode-ray tubes." General Electric Co., Ltd., and D. C. Espley. August 10th, 1934. (435639.)

24457. "Electric lampholders." P. Corbero Casals. September 18th, 1933. (435641.)

25002. "Relay for converting light variations into electric oscillations." J. Y. Johnson (Ternion Akt.-Ges.). December 15th, 1933. (Divided out of 32555/32.) (435643.)

26654. "Vacuum-tube amplifiers." Standard Telephones & Cables, Ltd. September 26th, 1933. (435646.)

34363. "Gas- and vapour-discharge tubes and circuit arrangements incorporating the same." Marconi's Wireless Telegraph Co., Ltd. November 29th, 1933. (435785.)

35214. "Electric lamps and similar devices." British Thomson-Houston Co., Ltd. December 8th, 1933. (435663.)

35693. "Electromagnetic track brakes." Knorr-Bremse Akt.-Ges. September 27th, 1934. (435836.)

36148. "Electric-discharge devices." General Electric Co., Ltd., N. L. Harris, J. T. Randall, and J. W. Ryde. December 17th, 1934. (435786.)

37004. "Method of avoiding pressure variations in electrolytic water decomposers working under pressure, when drawing off the gases produced therein." H. Baron (Siemens & Halske Akt.-Ges.). December 24th, 1934. (435669.)

37013. "Electro-dynamic sound reproducing devices." E. A. Huguenard. September 4th, 1934. (435670.)

1935

415. "Process allowing the conversion of a high-frequency current modulated at low frequency into very short current impulses and particularly applicable to direct-reading radiogoniometers and to the transmission of measurements." A. Bertrand and M. Parisier. January 5th, 1934. (435674.)

3477. "Temperature-compensated electromagnetic devices." Electric Auto-Lite Co. February 2nd, 1934. (435680.)

3671. "Cylindrical electric pocket torch." L. P. Lee. February 5th, 1935. (435683.)

7057. "Electrical power supply circuit arrangements for electron-discharge device apparatus." Marconi's Wireless Telegraph Co., Ltd. March 31st, 1934. (435733.)

7304. "Electric arc welding." Allmänna Svenska Elektriska Aktiebolaget. March 9th, 1934. (435734.)

7597. "Cathode-ray tubes." L. F. Broadway, W. F. Tedham, and F. H. Nicoll. March 26th, 1934. (Divided out of 9474/34.) (Cognate application 35296/34.) (435690.)

12788. "Transmitting systems for telekinematography." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. May 5th, 1934. (435749.)

17480. "Electrolytic deposition of a metal upon a metallised non-conducting surface." Electrical Research Products, Inc. June 20th, 1934. (435694.)

20170. "Gasfilled electric incandescent lamps." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). February 24th, 1934. (Divided out of 435697.) (435752.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 16th :—

Dynamoll. No. 563004. All goods in Class 1.—I. G. Farbenindustrie Gesellschaft, Frankfurt-am-Main, Germany. (British representatives: Abel & Imray, 30, Southampton Buildings, Chancery Lane, W.C.2.)

Yorcunic. No. 562919. All goods in Class 5.—Yorkshire Copper Works, Ltd., Stourton, Leeds.

Technico. No. B561730. Class 8. Electrically heated experimental furnaces and stills, and sterilising apparatus.—A. Gallenkamp & Co., Ltd., 17-29, Sun Street, E.C.2.

Head of Chinese (design only). No. 561316. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Telephone Manufacturing Co., Ltd., Hollingsworth Works, Martell Road, West Dulwich, S.E.21.

Ever Ready Radio (lettering and design). No. 562548. Class 8. Dry batteries and cells (electrical) and accumulators, not for medical purposes.—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

Rock. No. 560827. Class 13. Electric lighting, heating, and power fittings of ordinary metal.—Ranton & Co., Ltd., Claremont Road, Cricklewood, N.W.2.

Howmal. No. 562678. Class 13. Electric lamps (ordinary) for motor vehicles and ships.—Mallinson & Howell, 147a, Railway Street, Nelson, Lancs.

Ilo. No. 563028. Class 13. Electric light reflectors and shades made of ordinary metal.—Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

Gas on a Trolley-bus

THE blatant gas company advertising on the Ipswich trolley-bus illustrated herewith prompts a number of questions. Does the Ipswich Corporation thus display a fine impartiality? Is it of the opinion that *pecunia non olet*? Is

Gas enlists the aid of a trolley-bus. (Note overhead distribution system on the left of the picture.)

this form of advertising of such doubtful value that it doesn't matter what is advertised? Or is the Corporation, which owns the local electricity undertaking, so unafraid of gas competition that it can afford to let gas have its fling? Having suggested these points we leave readers to draw their own conclusions.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Houses (22), Burnley Road; Russell Bros., Ltd.

Acton.—Factory, Minerva Road; Crypto Equipment Co., Acton Lane, N.W.10. Flats (160), Creswick Road; M. Joseph, architect, 21, Hart Street, W.C.1. Flats (160), The Vale; Marshall & Tweedy, architects, 4, Cavendish Place, W.1.

Ashford (KENT).—Cinema, Station Road (electrical work); E. A. J. Jackson, architect.

Atherstone.—Houses (60); H. Hughes, surveyor, Council Offices.

Barrow-in-Furness.—Houses (84), Flass Lane; A. Fletcher & Sons.

Beckenham.—Church of St. Francis of Assisi, West Wickham (electrical work); J. E. Newberry and C. W. Fowler, architects.

Berwick-on-Tweed.—Houses (100); J. Davison, borough engineer.

Birmingham.—Houses (58), Court Farm estate; city engineer. Additions to Exhibition Buildings, Castle Bromwich, with electrical work; engineer, British Industries Fair, Castle Bromwich.

Blyth.—Railway station, for the London and North Eastern Railway Co.

Brierley Hill.—Cinema (electrical work) for Danilo (Brierley Hill), Ltd.; M. Dent, managing director, 13, Westbourne Road, Edgbaston, Birmingham.

Brighton.—Market buildings, with administrative offices, &c., Circus Street; Clayton & Black, architects, 10, Prince Albert Street.

Bromley (KENT).—Houses (24), Hayes; David Kenn & Sons, Ltd., builders, Bexley.

Cannock.—Houses (60); S. Harrison, Council's architect.

Carlisle.—Houses (22), Croft Road; S. W. B. Jack, architect. Buildings, Warwick Road and Spencer Street; Clutterbuck, Trevenen & Mawson. Store and offices, Botchergate; Graham & Roberts, Ltd. Extensions to Dovenby Hall mental defectives' institution (£30,000); city surveyor.

Carmarthen.—Houses (60); borough surveyor.

Chatham.—Cinema, electrical work, for Palace (Chatham), Ltd.; David Weston, 62, High Street, Rochester.

Cheshire.—School, Altrincham (£31,782), for County E.C.; J. E. Rangeley, builder, Rochdale. School, Newton-by-Chester; W. E. Gittins, builder, Aberderfyn. Schools, Higher Bebington and Greasby; county architect, The Castle, Chester.

Chesterfield.—Houses (57), Eckington; R. Quince & Sons, builders, Penistone Road, Sheffield.

Cosham (HAMPSHIRE).—Church, Highbury estate; Frank J. Privett, Ltd., builders, Portsmouth.

Dartford.—Extensions to Bow Arrow Lane Hospital (£65,200), for the Joint Hospital Committee; E. J. Hobbs, clerk, West Hill.

Darvel.—Houses (68), Kirkland Road (electrical work); Mr. Valentine, architect.

Dewsbury.—Extensions to factory, Brewery Lane; Yorkshire Electric Transformer Co., Ltd.

Dukinfield (CHESHIRE).—Houses (42); borough surveyor.

Dundee.—Premises, 41-49, Murraygate; Marks & Spencer, Ltd.

Ealing.—Houses (100), Bilton Gardens; Taylor Woodrow Estates, Ltd., 10, Grange Parade, Hayes. Houses (21), Rothesay Avenue; Middlesex Homes, Ltd. Houses (24), Whitton Avenue; Hillingdon Estate Co., 29, Peterborough Road, Harrow.

Easington (DURHAM).—Houses, Crimdon Dene Park, and four public baths (£60,000); W. Clarke, R.D.C. surveyor.

Galston.—Houses (200); burgh surveyor.

Gateshead-on-Tyne.—Extensions to Sheriff Hill Hospital (£65,000); F. H. Patterson, borough engineer, Town Hall.

Glasgow.—Paint factory; Bryden, Robertson & Boyd, architects, 147, Bath Street, Blythswood, Glasgow, W.C.

Golborne (LANCASHIRE).—Houses (99), near Grimshaw Street, for R. Evans & Co., Ltd.

Goole.—Houses (57); P. P. Taylor (Doncaster), Ltd., builders.

Gosforth (NORTHUMBERLAND).—Houses (230); C. Wyld, U.D.C. surveyor.

Great Yarmouth.—Houses and tenements, Con estates (£17,000); J. Balls & Sons, Ltd.

Hadleigh (ESSEX).—Cinema and dance hall, electrical work, for Kingsway (Hadleigh), Ltd.; L. C. Norton, architect, 43, Albemarle Street, London, W.1.

Halifax.—Houses, flats and bungalows, Ovenden Hall estate; borough surveyor.

Harworth (DONCASTER).—Houses (100), Bawtry Road; Barber, Walker & Co., Harworth Colliery.

Hastings.—Houses (97), Hollington estate (£38,474); borough engineer. Development of Briars estate; Silverhill; F. Gordon Watford, architect.

Kent.—School, Galley Hill, Swanscombe, for County E.C.

Kettering.—Houses (110), Avondale estate; U.D.C. surveyor. Estate development, near Warkton Road; F. G. Barlow, Ltd. Factory, Tresham Street; Seddon & Arlidge, Ltd. Extensions to factory, Shaftesbury Street; Tailby Bros.

Kilsyth.—Houses and a hostel; J. I. Little, burgh surveyor, Innsbridge.

Lanarkshire.—Public Assistance offices and library, Cambuslang (electrical work), for C.C.; J. Stewart, county architect, 32-36, Albert Street, Motherwell.

Largs.—Business premises (£15,000); J. Houston, architect, Bridgent House, The Cross, Kilwinning.

Liverpool.—Factory, Hillfoot Road, Speke, for M. & S. Shifrin, 27, Cranmer Street; J. Worthington, builders, Shaw Street.

London.—(E.C.1).—Buildings, Minories, Haydon Street and Swan Street; Fuller, Hall & Foulsham, architects, 212, High Holborn, W.C.1. Buildings, 25-6, West Smithfield, and 21, Hosier Lane; Joseph Hill, 34, Gordon Square, W.C.1. (S.E.1). —Premises for National Provincial Bank, Westminster Bridge Road; W. F. C. Holden, architect, 15, Bishopsgate, E.C.2. (STOKE NEWINGTON).—Factory, Mason's Court; Holland, Hannen & Cubitts, Ltd., 1, Queen Anne's Gate, S.W.1.

Manchester.—Houses (46), Horncastle Road, Clare Avenue, and Rudston Avenue, Moston; Booth Tonge & Co., builders, 47, Church Street, Harpurhey. Houses (34), Joan Street, Moston; Provincial Building Co., builders, 16, Deansgate. Houses (44), Rossall Avenue and Bransby Avenue, near Rochdale Road, Blackley; Greenwood & Tyson, builders, New Milne estate, St. Mary's Road, Moston. Elementary school, Bowker Vale, Crumpsall, for E.C.; architect's department, Education Offices, Deansgate, Manchester.

Middlesbrough.—Elementary school, Whinney Banks estate, for E.C.; P. Haswell, architect, Woodlands Road.

Midlothian.—School, Penicuik, with electrical work; county architect, 10, Drumsheugh Gardens, Edinburgh.

Morpeth.—Branch store for the Ashington Industrial Co-operative Society; Glass, Harrison & Ash, architects, 20, Saville Row, Newcastle-on-Tyne.

Nailsworth (GLOUCESTERSHIRE).—Houses (30); U.D.C. surveyor.

Newburn-on-Tyne.—Houses (30), West Denton estate; Constable & Mackenzie, builders, Lemington.

Newcastle-on-Tyne.—Houses (219), in connection with slum clearance scheme for T.C.; R. G. Roberts, housing architect, 18, Cloth Market. Senior school (480 pupils), Northumberland Road, for E.C. (£22,000); Walter Willson (Gateshead), Ltd., builders, Grey Street, Newcastle-on-Tyne.

Newport (I.O.W.).—Cinema, Pyle Street and Town Lane, for Odeon (Newport), Ltd. County offices, High Street; Mr. Gutteridge, architect. Extensions to secondary school; J. Ball & Son.

Northampton.—Stores, The Riding; Northampton Co-operative Society, Ltd. Extension to boot factory, Brockton Street; G. Webb & Sons.

Northern Ireland.—(LONDONDERRY).—Employment exchange, Bishop Street; secretary, Ministry of Finance (Room 128), May Street, Belfast.

Northolt.—Extensions to film studios, Islips Manor; Gaumont British Picture Corporation, Ltd.

Pershore.—Houses (22); R.D.C. surveyor.

Port Erin (I.O.M.).—Cinema, for the Strand Cinema Co., Douglas; secretary.

Port Talbot.—Additions to Port Talbot County School; county surveyor, Glamorgan County Hall, Cardiff.

Purfleet (ESSEX).—Houses (64); U.D.C. surveyor.

Purley.—Shops and houses, Old Lodge Lane; G. T. Crouch, Ltd.

Radcliffe (LANCASHIRE).—Houses (168), Dumers Lane site; U.D.C. surveyor.

Ramsgate.—Cinema, King Street, for Odeon Theatres, Ltd., Birmingham.

Rawtenstall.—Houses, Barnfold estate, Waterfoot; Churnside & Haworth.

Redcar.—Houses (240) and shops on estate adjoining Kirkleatham Lane; J. E. Picknett, builder, 84, Corporation Road.

Rhondda.—Houses (40), Church Street and William Street, Llwynypia, and clinics, Oakland Terrace, Ferndale, and Ynyswen, Treorchy; E. Taylor, R.D.C. surveyor.

Richmond (YORKSHIRE).—Cinema with shops and dance hall at the junction of Frenchgate and Station Road; E. J. Hinges, Ltd., promoters, 72, Grey Street, Newcastle-on-Tyne.

Rochdale.—Houses (400); J. R. Williams, housing architect, Town Hall, Rochdale.

Romford.—Houses (76), Rush Green estate; Pavitt Bros., Ltd.

Rotherham.—Houses, Herringthorpe and Canklow; borough engineer. Gymnasium and refreshment room, Millmoor Football Ground; United Football Club, Ltd.

Rushden.—Cinema, College Street and Alfred Street, for Palace Theatre Co., Ltd. (Wellingborough); Talbot, Brown & Fisher, architects, Wellingborough.

Sanderstead.—Houses (22), Ashdown Gardens; Meakin, Archer & Co. Houses (26), Barn Crescent; J. Laing & Son, Ltd. Houses (56), Benhurst Gardens; R. Costain, Ltd.

Sedgley.—Cinema and shops, Bull Ring; R. Satchwell.

Shipley.—Houses (56), Fernhill Road; C. Houlden.

Somerset.—Schools, Milton, Weston-super-Mare, for County E.C.; Pople & Son, builders, Burnham-on-Sea.

South Shields.—Senior school (880 places), Cleadon Park, for E.C.

Stockton-on-Tees.—Houses, Clifton Avenue and Burford Avenue; J. C. Watson, builder, High Street.

Tweedmouth.—Premises, Prince Edward Road, for the Tweedside Industrial Co-operative Society; Scottish Co-operative Wholesale Society Building department, Edinburgh.

West Lothian.—County Council offices, &c. (£58,000); county clerk, Linlithgow.

Whiston (LANCS.).—Additions to Council offices, Delph Lane; Gornall & Wainwright, architects, 8, Hardshaw Street, St. Helens.

Wilmslow (CHESHIRE).—Cinema, Green Hall estate, electrical work, for W. W. Stansby, Elysian Cinema, Cheadle Hulme.

Wincanton.—Houses (40), Wayclose; R.D.C. surveyor.

Woking.—Houses (58), Sheerwater estate, for Thomas & Co. Houses (21), Petersham Avenue, Byfleet, for G. Finnegan. Factory, Maybury, for W. & N. Products, Ltd.

Wolverhampton.—Extensions to hospital, Compton Road; Lavender & Twentyman, architects, Waterloo Chambers, Waterloo Road.

Worcestershire.—Schools, Droitwich, Halesowen and Cradley; A. V. Rowe, county architect, Worcester.